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1859 1959
CENTENNIAL YEAR

American Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

PILOT.. ..LIGHTS

Hot, Electrifying Subject

Ever since Ben Franklin toyed with a kite during a thunderstorm, man has been diligently seeking means of producing electricity efficiently. Except in thunderstorms — and, we suppose, in atomic structures to hold together the electrons, protons, etc., ad infinitum — electricity just doesn't exist in a natural form. This means that man must convert some other form of energy — latent or otherwise — to electrical energy. For nigh on 100 years scientists have played with thermoelectric devices . . . but only in recent years has real progress been made. Recent research developments in the many facets of the field of energy conversion promise radical changes for tomorrow. With this in mind, AGJ probes another new frontier of science in this issue — thermoelectric methods of converting gas heat to electricity. In the second of a series on energy conversion methods, devices, ideas, and power sources, the article provides food for thought on what these developments may mean to the gas industry in "The Century Ahead."

*

Next Month

Gas distribution companies will spend almost $1-billion in 1959 for new and replacement facilities . . . but how much will they really get for their money? In May, AGJ takes a hard look at one of the industry's toughest problems — rising costs. In addition to discussing what's happening, the May issue will be bulging with articles discussing how to get more for your money — by using better equipment, better methods, better planning, and adopting new ideas.

*

Editorial Index Now Available

Readers desiring a copy of the annual index to Volume 185 (January-December 1958) of AGJ can obtain a copy by writing to: *Department AI, American Gas Journal, Box 1589, Dallas 21, Texas.* Be sure to address your request to this department so that it will receive prompt attention.

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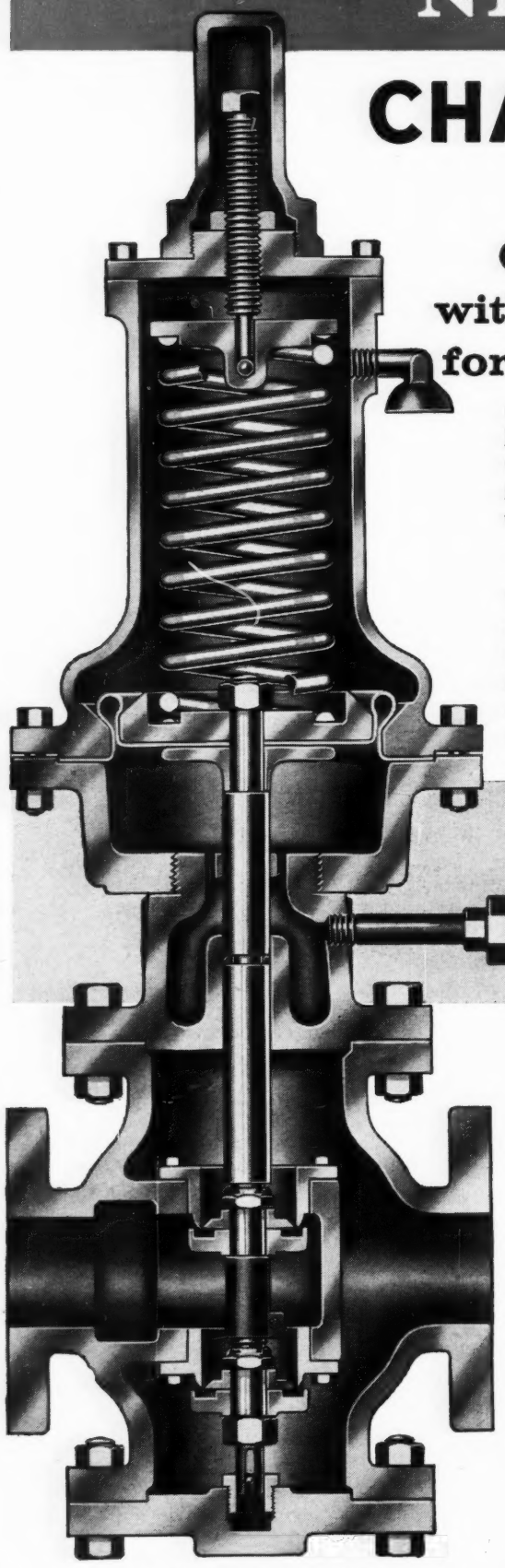
NEW IN PRINCIPLE!
NEW IN DESIGN!



2" - 3" - 4" - 6"
Write for Bulletin 57-S

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with "ROLL-OUT" Diaphragm for constant pressure control

Chaplin-Fulton Model 57-S is a simple spring loaded regulator which performs like a pilot loaded regulator, without the added complications. For pounds-to-pounds service—inlet pressures to 400 psi—controlled pressures to 75 psi, with deviation through full valve travel less than 1 psi.

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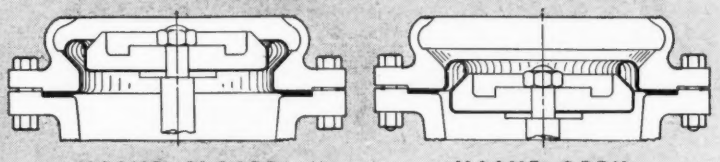

Note how, with the valve upwards in the closed position, the diaphragm achieves its maximum effective area—and decreases as the valve opens. The area changes at the same rate as the spring loses compression, to give a constant controlled pressure—determined entirely by valve movement.

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MCF

NEWS HILITES OF THE INDUSTRY

Successful voyage of the "Methane Pioneer" and the startling estimate that gas can be purchased, liquefied, and shipped from a Gulf port to London, England for about 35 to 50 cents per Mcf, has set conjecture rocketing in several quarters. Pemex's director general, Pascual Gutierrez Roldan, says Mexico may be ready to make similar LNG exports if and when ships are available and if the price of gas is appealing. To the north, Canada's *Financial Post* notes "some market discussions have taken place with Japanese interests concerning possible tanker shipments of Canadian liquid gas." Potential Japanese consumption is estimated at 900 billion cu ft annually by 1975, or over four times Canada's current domestic consumption rate. According to FP, conceivably Alberta or Peace River gas in northeastern British Columbia could be transported to a B.C. coastal point, liquefied there, and loaded on special tankers. In the U. S., utilities are taking another look at "liquefaction" and a western firm is currently investigating it as a source of peak shaving.

Turn of the Tide? Bill providing for the use of state and federal funds to reimburse public utilities for relocation of their facilities where necessitated by interstate system highway construction has been given final passage by the **New Mexico** legislature and sent to the governor for his signature. A similar 1957 bill was declared unconstitutional by the State Supreme Court in November 1958, because it violated a ban against public payments of benefit to private interest. New proposal seeks to overcome the court's objections by preventing utility from making any profit from relocation. Companion measure to allow state to reimburse cities for relocation of municipal utility lines also won approval. In **Washington,** State House of Representatives okayed a bill providing for reimbursement of cost of relocating facilities along interstate highway projects, and sent it to the State Senate. Bill will permit state to make payment along projects where the state can get 90 percent reimbursement from the federal government. **In West Virginia,** a bill introduced in the state senate makes any cost involved in relocating public utility lines in connection with any federal-aid interstate highway project a part of the highway construction outlay to be paid from the state road fund.

Latest in Arkansas Louisiana Gas Company's diversification plans is purchase of the Humphrey line of gas heating equipment manufactured by General Gas Light Company of Kalamazoo, Michigan, by Arkla Air Conditioning Corporation, a wholly owned subsidiary. Humphrey radiant fire heaters, room circulators, wall heaters, bathroom heaters, suspended unit heaters, duct furnaces and residential central heating equipment will be manufactured by the Arkla plant at Evansville, and continued and expanded in the Appliance division of Arkla. Other products of General Gas Light Company were not involved in the transaction, and the company will continue to manufacture and market its gas lights and pneumatic devices.

In Canada, natural gas reserves — proved and recoverable — rose 2.552 trillion during 1958 to a sizable total of 23.295 trillion cu ft. Alberta is credited with the largest provincial reserve — 20.223 trillion cu ft — and British Columbia ranks second with 1.688 trillion. Reserves of 100 trillion are predicted in next few years by the Canadian Petroleum Association.

Natural gas reserves in the U. S. hit a new record of 254 trillion cu ft in 1958 according to a report released jointly by the American Gas Association and the American Petroleum Institute. Net gain of 7.6 trillion cu ft occurred even though net production amounted to 11.5 trillion cu ft just short of the all-time peak production of 11,502 billion cu ft produced in 1957. Additions of 19 trillion cu ft included some 5.6 trillion cu ft of new discoveries. New discoveries of natural gas liquid reserves totaled 108,200,000 bbl, second highest in history, and brought total estimated liquid reserves to 6.2 billion bbl.

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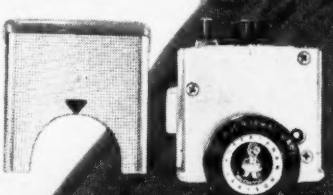

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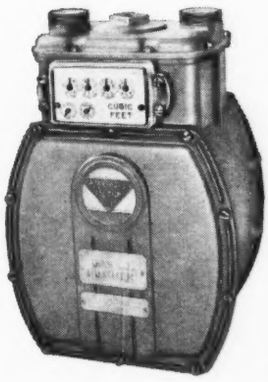

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COMING EVENTS IN THE GAS DISTRIBUTION INDUSTRY

April

1- 3 GAMA, annual meeting, Americana Hotel, Bal Harbour, Florida.

6- 7 Instrument Society of America, 2nd national symposium on chemical, oil, and gas instrumentation, St. Louis, Missouri.

6- 9 A.G.A. distribution conference, Netherland-Hilton Hotel, Cincinnati, Ohio.

7- 9 A.G.A. industrial and commercial sales conference, Hotel Warwick, Philadelphia, Pennsylvania.

10- Maryland Utilities Association, annual convention, Baltimore, Maryland.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Oklahoma.

16- Pennsylvania Gas Association production conference, Drexelbrook Swimming and Tennis Club, Drexelbrook, Pennsylvania.

19-23 ASME Oil and Gas Power Division conference and exhibit, Shamrock-Hilton Hotel, Houston, Texas.

20-22 A.G.A.-EEI accounting conference, Sherman Hotel, Chicago, Illinois.

23-24 Indiana Gas Association, annual convention, French Lick-Sheraton Hotel, French Lick, Indiana.

27-29 SGA annual convention, New Orleans, Louisiana.

May

3- 6 LPGA annual meeting, Conrad Hilton Hotel, Chicago, Illinois.

5- 7 14th Purdue Industrial Waste Conference, Purdue Memorial Union Building, Lafayette, Indiana.

5- 7 A.G.A. research and utilization conference, Cleveland, Ohio.

7- Symposium on Corrosion Inhibitors, Theory and Mechanism, sponsored by Armour Research Foundation and Chicago Section of Electrochemical Society, Illinois Institute of Technology, Chicago, Illinois.

11-12 A.G.A. eastern sales conference, Netherland-Hilton Hotel, Cincinnati, Ohio.

18-19 A.G.A. transmission conference, Statler-Hilton Hotel, Dallas, Texas.

18-20 A.G.A. midwest sales conference, Edgewater Beach Hotel, Chicago, Illinois.

19-21 Pennsylvania Gas Association, annual meeting, Pocono Manor, Pennsylvania.

21-22 Natural Gas & Petroleum Association of Canada, annual meeting, Hamilton, Ontario, Canada.

25-27 A.G.A. chemical, engineering and manufactured gas production conference, Hotel Sheraton, Rochester, New York.

25-29 National Fire Protection Association, annual meeting, Atlantic City, New Jersey.

27-28 PCGA distribution conference, operating section, Mar Monte Hotel, Santa Barbara, California.

30-June 5 Tenth Annual Industrial Research Conference, Columbia University, New York, New York.

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ONE of the most practical and economical steps you can take to insure against costly distribution line failure is to use the proven protection of quality *coal tar* coatings.

And when it comes to coal tar coatings, more and more gas companies are depending on PITT CHEM Enamels—protection that has been proven over the years on major transmission lines and distribution lines alike. No other material can do a better or more economical job of resisting soil stress and water absorption.

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SAFELY stop-off 3″ and 4″ lines SIMPLY UNDER PRESSURE

MUELLER® NO-BLO® Method

Two new machines – the CH-6 Drilling Machine and the H-17246 Completion Machine – now offer another Mueller No-Blo method for stopping-off 3″ and 4″ lines under pressure.

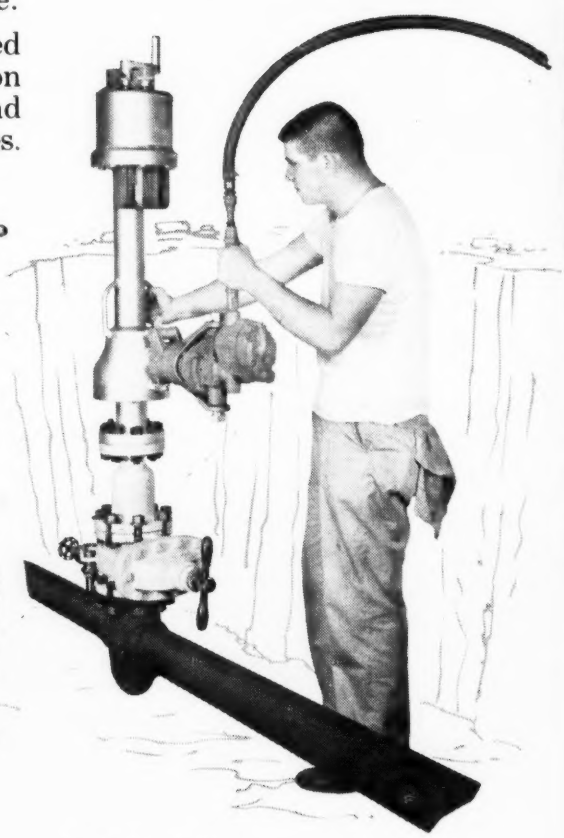
Here is shown the step-by-step method developed to stop-off a 4″ line in an all-welded, steel distribution system using a Mueller Line Stopper Fitting and these new machines.

STEP 1. WELD

Weld Line Stopper Fitting and Save-A-Valve Drilling Nipple to main. Test welds. Bolt special Mueller gate valve—hand tight—to fitting and open valve. Attach small gate valve to drilling nipple used for equalizing and purging connection.

STEP 2. ALIGN

Attach alignment tool and completion plug to shaft of new H-17246 Completion Machine. Bolt machine—hand tight—to valve. Align machine and valve with fitting and insert plug into fitting. Tighten bolts. Mark position of machine on valve. Remove completion plug and machine.

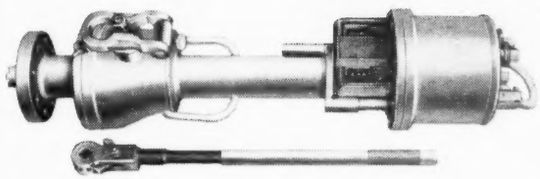


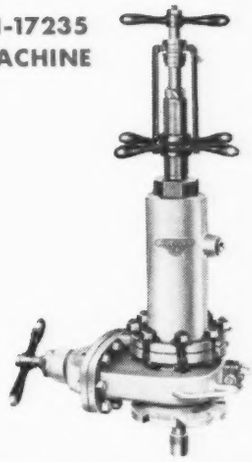
STEP 3. CUT

Bolt adapter to new CH-6 Drilling Machine and attach cutter arbor, pilot drill and shell cutter to boring bar. Bolt machine to valve, set amount of cut needed and engage automatic feed. Mount air motor on machine and open throttle. ("CH-6" will automatically make cut and disengage feed—without supervision). Retract boring bar, close valve and remove machine.

These new and greatly improved machines are typical of the constant attention to detail in research, design and engineering that becomes a part of all Mueller No-Blo fittings and equipment produced for the gas industry. Write for complete information today.

MUELLER H-17235
STOPPING MACHINE



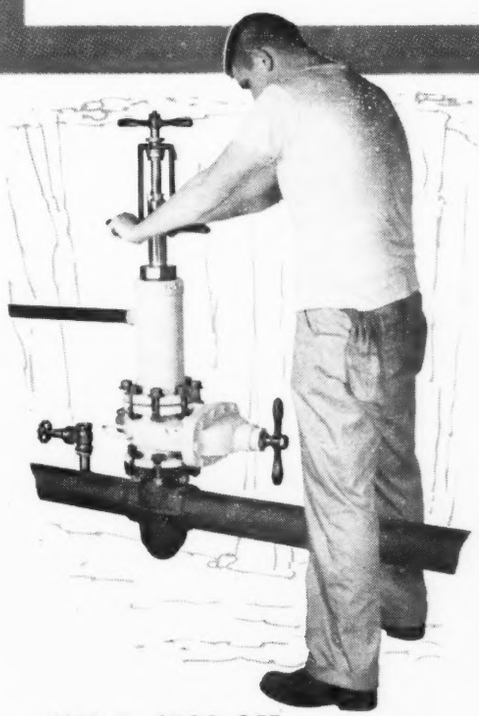


NEW!
MUELLER CH-6 DRILLING MACHINE

A fast, new, automatic drilling machine that greatly reduces the time needed to make the cut through the main. New design and new features make it simple and easy to operate and handle—even for inexperienced personnel. And automatic power cutting completely frees the operator from continually checking the machine during the cutting operation.

NEW! MUELLER H-17246 COMPLETION MACHINE

This new machine has just been added to Mueller's Line Stopper Unit No. 2. It is specifically designed for inserting and extracting 3" and 4" completion plugs—freeing the H-17235 Stopping Machines for stop-off work only. Balanced pressure design of the new "H-17246" equalizes line pressure within the machine. Shaft and plug are easily advanced and retracted without bucking full effective force of line pressure.



STEP 4. STOP-OFF

Attach stopper to shaft of H-17235 Stopping Machine and bolt machine to valve. Assemble by-pass and equalizing piping and place by-pass in operation. Open gate valve, lower stopper into fitting and expand. (If two fittings are used, a section of line may be completely isolated to permit tie-ins, relocations and repairs without interrupting service). Contract and raise stoppers, close valve and remove by-pass piping and machine.

STEP 5. PLUG

Fasten E-Z-Release inserting tool and completion plug to shaft of new "H-17246" and bolt machine to gate valve in same position as marked. Open valve and insert plug solidly into top of fitting. Test for tightness of plug. Release plug and remove machine and gate valve. Plug all drilling nipples with appropriate machine and remove gate valves.

STEP 6. CAP

Position gasket on flange of fitting and bolt completion cap firmly in place. Tighten plugs and cap all drilling nipples. Test entire set-up with soapsuds. (Operation now completed and ready for backfilling.)

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MEN AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

● **Gene Keene** has been named manager of the City Utilities Gas Department of Springfield, Missouri, succeeding **William Gaylord** who retired in March 1959, after more than 25 years of service. Keene has been Gaylord's assistant the last five years.

● **Charles Pennypacker Smith** has been named vice president and manager of Alberta and Southern Gas Company, Ltd., the Canadian firm organized by Pacific Gas and Electric Company to obtain natural gas supplies for transmission to the California market. Smith has also been elected to the A&S board of directors. His promotion resulted from the retirement of **J. K. Horton,** who will become president of Southern California Edison Company. Smith has been serving as manager of operations for A&S.

● **John F. Roberts, Jr.** has been named manager of the rate department for Pacific Gas and Electric Company succeeding **Rudolph Jenny** who is retiring after nearly 47 years with the company.

● **William J. Fountain** has been employed as an attorney in the New York office of Consolidated Natural Gas Company.

J. A. Croft

P. W. Rogers

H. A. Titsch

W. G. Hickle

● Recent personnel changes at Ohio Fuel Gas Company include promotion of **John A. Croft,** former distribution department general engineer, to supervisory engineer and Columbus Group system sponsor for the Columbia Gas System Service Corporation in New York. Croft will move to New York and act as liaison man between O-F and the Service Corporation. **Paul W. Rogers,** vice president and chief engineer of O-F, has been elected a director of the company. **Herbert A. Titsch,** manager of the production department, has been elected a vice president. **William G. Hickle** has been promoted to general engineer in the plant operations department and will work with district plant managers and district engineers to coordinate planning of distribution construction and maintenance projects.

● Brooklyn Union Gas Company has announced the retirement of senior vice president **Samuel Green** after a 47-year career with the company.

● **G. Stockton Strawbridge,** president and general manager of Strawbridge & Clothier, of Philadelphia, has been elected a director of the Philadelphia Electric Company to fill the vacancy caused by the death of Charles S. Redding.

● **Peter Kiewit,** president of Peter Kiewit Sons, Inc., has been elected a member of the board of directors of Northern Natural Gas Company.

● **Jack P. Harris,** president of the Hutchinson Publishing Company and editor and publisher of the *Hutchinson News,* has been elected a director of the Kansas Power and Light Company.

● **David Packard,** president of Hewlett-Packard Company of Palo Alto, California, has been elected a member of the board of directors of Pacific Gas and Electric Company.

● Republic Natural Gas Company has elected two new members to its board of directors — **James A. Lewis,** president of James A. Lewis Engineering, Inc., and **John W. Rutland, Jr.,** senior partner of the Dallas law firm, Thompson, Knight, Wright & Simmons. **Jack R. Fraswer,** manager of the company's gas department, has been elected a vice president.

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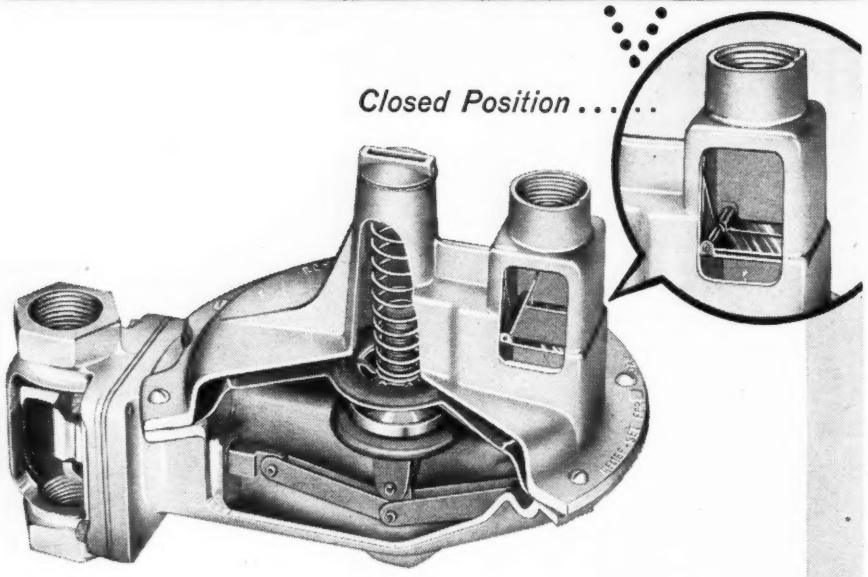
Closed Position . . . . .



This new Reynolds relief valve has a double action sealing effect which permits the use of a large relief valve orifice which still seals and relieves within close regulation.

An Automatic quick opening flapper for excess pressure gas and yet has standard small vent opening for normal regulation.

The all stainless steel construction flapper valve eliminates high shock-lock off common to other type regulators.

Also available on NRT8010 series No. 1 Model 10, No. 1 Model 20, and No. 1 Model 30 series.

GAS CONTROL SINCE 1892

Not Shown—A Complete Line of Outside Vent Protection

Write for detailed information

REYNOLDS GAS REGULATOR CO.

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Personals

● Seven recent organizational changes at The Hartford Gas Company include appointment of **Howard R. Carlson,** as director of advertising and public relations, a newly created executive post. Carlson was formerly general sales manager and is succeeded by **Richard B. Barger** in that post. **E. Ralph Kryzak,** formerly manager of company's Manchester division, succeeds Barger as heating and air conditioning sales manager, and he will also be responsible for activities of new building division. **George L. Davis,** formerly sales representative, has been appointed manager of the Manchester division. **A. Chandler Taylor, Jr.,** has been named assistant to the president. **Herbert E. Johnson,** formerly assistant to the president, has been appointed general superintendent, operating department. **Robert B. Turner,** purchasing agent, has been given direct supervision of company's store division.

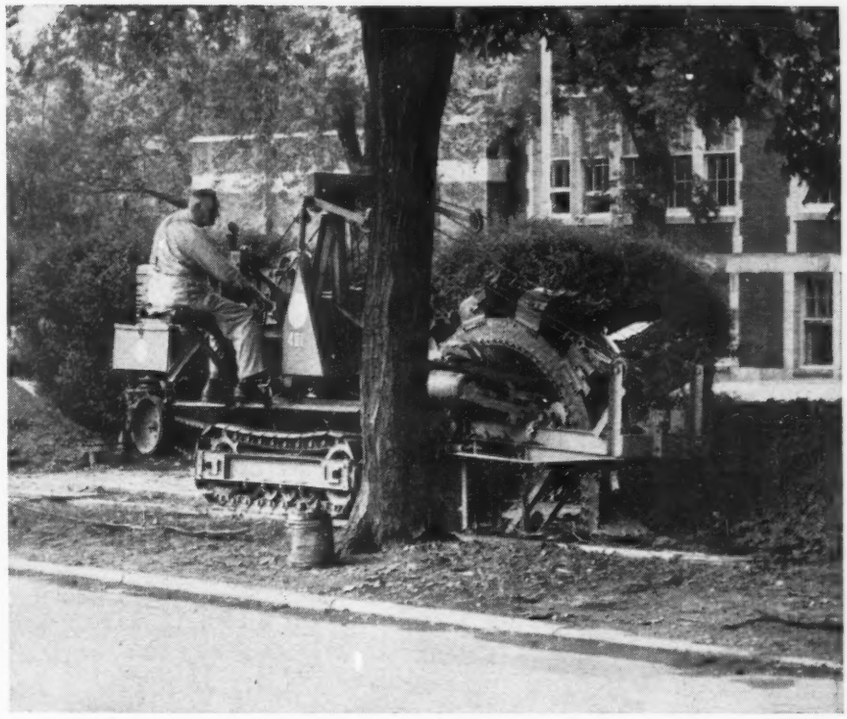
William Golding

● **William Golding** has been appointed utility administration coordinator for Norge Division of Borg-Warner Corporation, with responsibilities including Norge utility appliance advertising and marketing.

● **A. C. Cherry,** manager of gas operating department of the Cincinnati Gas & Electric Company, has been promoted to assistant to the vice president in charge of the gas department. **James A. Whelpley,** formerly Cherry's assistant, succeeds him in the post of manager of gas operations. **J. P. Stephens** has been named assistant to Whelpley, and will be in charge of gas supply and pressure control. He formerly was in charge of production and measurement.

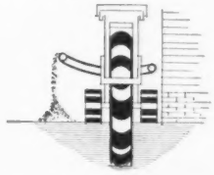
● Arkansas Louisiana Gas Company has announced serveral recent gas distribution system changes. Two new distribution districts have been formed in south Arkansas, each headed by a newly appointed plant operator. **Rupert Halbert** has been named plant operator for the Dumas district comprised of Grady, Gould, Star City, and Dumas which were formerly a part of the Pine Bluff and Monticello districts. **Dalton V. Walker** has been named plant operator for the new Sheridan district which includes Prattsville, Poyen, Sheridan and their extensions. These towns formerly a part of the Pine Bluff and Malvern districts. **Paul Buchanan** has been named manager of the Stamps district in addition to his duties as manager of the Magnolia district. **Stanley Wentworth,** former manager at Stamps, has been transferred to El Dorado as superintendent of distribution-operations replacing **Jack D. Crank** who has transferred to Shreveport as engineer in the operations engineering department.

● **Lloyd E. Cooper** has been promoted to vice president and chief engineer of California-Pacific Utilities Company, San Francisco. He was formerly vice president with responsibilities over rate matters and gas operations; in his new position he will be responsible for engineering and planning as well as continuing supervision over rates and commission matters for the company's multiple utility service departments.

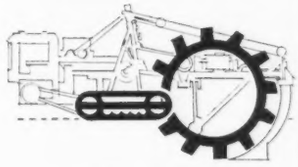


Nothing digs trench in the city like a Cleveland "Baby Digger"

PUTS TRENCH WITHIN 20 INCHES OF A PARALLEL WALL



MORE THAN 30 USABLE COMBINATIONS OF CRAWLER AND DIGGING WHEEL SPEEDS



GIVES YOU THE RIGHT COMBINATION of POWER and SPEED FOR EVERY SOIL AND JOB CONDITION

If your jobs involve city and suburban trenching, a trim maneuverable Cleveland 92 is the trencher for you. This "Baby Digger" has the practical features and advantages that give you greater, more economical production in crowded areas *...more trench...in more places...at less cost.*

- Only 4' 6" wide over its crawlers.
- Shiftable, reversible conveyor.
- Digs easily past trees, poles, fences, etc.
- Digs 10" to 20" wide...down to full 5' deep.
- Full crawler mounting...completely maneuverable...perfect balance and stability...easy on lawns, sidewalks, etc.
- Finest crawler on any trencher...long-lived ...non-packing...easy-rolling...friction-free...sealed bearings...200-hour lubrication.
- Easily portable...hustles from job to job at safe, legal-limit truck speeds.
- Used on thousands of miles of trenching for gas...water...sewer...telephone...electric power...building footings...airport, highway construction.

fast • accurate • clean • dependable nothing digs trench like a Cleveland

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

GEM SELLS GAS...

No more dog days...!
Plenty of hot water... all the time!
when GAS does the 7 big household jobs AUTOMATICALLY
The only litter allowed...
my GAS incinerator burns all the rest

GAS EQUIPMENT MANUFACTURER'S GROUP

GEM

MEMBER

GAS is 7 ways better for the 7 big household services

GAS is 7 ways better for the 7 big household services

Helping the Gas Industry— and everyone in it— to grow and prosper!

FREE

reprints and newspaper mats of National Consumer Advertisements, for use by Gas Utilities and LP-Gas Marketers, are available. GEM price tags, with room for appliance prices and terms, can be obtained at $10. per 1000.

MR. SUPPLIER:

It takes *dollars* and *sense* to run the GEM program of national advertising. GEM advertisements in consumer magazines—Saturday Evening Post, Better Homes and Gardens, New Homes Guide and Home Modernizing—sell GAS, GAS appliances and GAS equipment. They build business for every part of the GAS industry.

Won't you do your share to ensure a fabulous future for the GAS industry by helping to underwrite the GEM program?

What's in it for you? Consistent growth and prosperity as *your* customers expand and flourish.

Join GEM today! Write GEM Committee, Room 2925, 60 E. 42nd Street, New York 17, N. Y.

These 15 sponsors are underwriting the GEM 1959 program of national advertising:

American Cast Iron Pipe Co.
American Meter Co.
Cleveland Trencher Co.
Fisher Governor Co.
E. F. Griffiths Co.
Koppers Co. Inc.
Mueller Co.
Pipe Line Service Co.
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.
Subsidiary of Neptune Meter Co.
The Tapecoat Co.
U. S. Pipe and Foundry Co.
Vulcan Rubber Products
Division of Reeves Brothers, Inc.

M. Anuskiewicz

W. B. Cameron

● **Michael Anuskiewicz,** formerly engineer of development and planning department, has been elected assistant chief engineer of Brooklyn Union Gas Company. **William B. Cameron,** previously assistant to the chief engineer, has been appointed engineer of development and planning.

● Two recent executive re-assignments at Public Service Company of Colorado are: **Paul A. Yetter** has been reassigned from vice president of division operations to vice president in charge of the advertising, employee and public information departments. **Ralph Sargent, Jr.,** former assistant to the president, has been named manager of division operations succeeding Yetter.

● Colorado Interstate Gas Company has elected two new vice presidents and a treasurer. **Peter J. King, Jr.** has been elected vice president for corporate and financial matters, and **Thomas L. Pelican** has been named vice president for engineering. **John J. Yeonopolus** has been named treasurer to replace **William B. Kice** who retired at the end of 1958.

● **Mrs. Marjorie Lillenberg** has been appointed home service manager of The Peoples Natural Gas Company of Pittsburgh. She was formerly home service director of Oklahoma Natural Gas Company.

● Stone & Webster Engineering Corporation has announced the promotion of several top executives. **Fred W. Argue,** engineering manager and a vice president, has been elected executive vice president. **Alfred L. Hartridge,** treasurer and a vice president, has been elected financial vice president and will make his headquarters in the New York office where, in addition to other responsibilities, he will coordinate financial activities of the corporation's various domestic and foreign subsidiaries. **Richard N. Benjamin,** president of Stone & Webster, Inc., has been elected a director of Stone & Webster Engineering and **F. E. Conger** has been appointed assistant secretary.

● **Rex B. Grey** has been appointed manager, control division of Southwestern Industrial Electronics Company, a Division of Dresser Industries, Inc. Grey comes to SIE from the Texas Apparatus Company which he founded in 1954. In his new appointment, he will be responsible for sales, service, and market areas of the control division and will select and administer production of new systems and instruments.

F. J. Schafer

Frederick J. Schafer, 87, former vice president in charge of manufacture and distribution of Southern California Gas Company died January 26. He had served as president of the Pacific Coast Gas Association prior to his retirement from Southern California in 1937.

● **Elo Blomquist** has been appointed manager of plastics division sales for Walworth Company succeeding **Sidney A. Lewis** who was recently promoted to manager of technical sales services. Blomquist will be responsible for promotional and sales activities regarding Walworth's PVC line of valves and fittings.

● **D. E. O'Connor** and **T. J. Merritt** have joined the Houston, Texas, engineering department of Commonwealth Services Inc. O'Connor will act as chief engineer of the Houston office, and Merritt will be responsible for industrial engineering in Houston.

● **Archie C. Anderson** has been named technical director of A. O. Smith Corporation's new Reinforced Plastics Division. **Dwight H. Davis** has been appointed as controller and administrative assistant of the division. Prior to his appointment, Anderson headed A. O. Smith's Reinforced Plastics Development Laboratory.

● **Buel M. Wallis** has been elected a vice president and officer of Schield Bantam Company with the new title of vice president-director of marketing. As head of the marketing division, he will be responsible for sales development, order bureau, service, parts, traffic, domestic and export sales departments.

● J. I. Case Company has announced two recent appointments: **Robert J. Nixon,** former president of Motor Products Corporation of Detroit, has been appointed to a management staff position at Racine headquarters; **Lawrence H. Hodges,** former chief product engineer, has been appointed manager of the Rockford, Illinois, Works.

Dearborn *Quality in Action...*

is your best package of

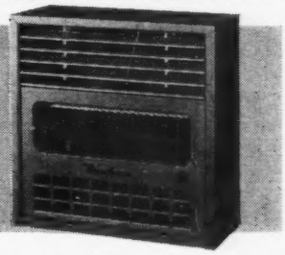
PROFIT

The NEW Dearborn Sealed-Vent WALL HEATER

This amazing new Dearborn Sealed Vent thru-the-wall gas area heater introduces a new dimension in beauty and safety! Extremely simple installation. Expertly and tastefully designed by the makers of the outstanding Dearborn Regency, it will please the eye—provide safety and comfort for any customer. It is an outstanding example of Dearborn design and engineering bringing you even more *quality-in-action.*

NEW from Dearborn, the *Clip-on*

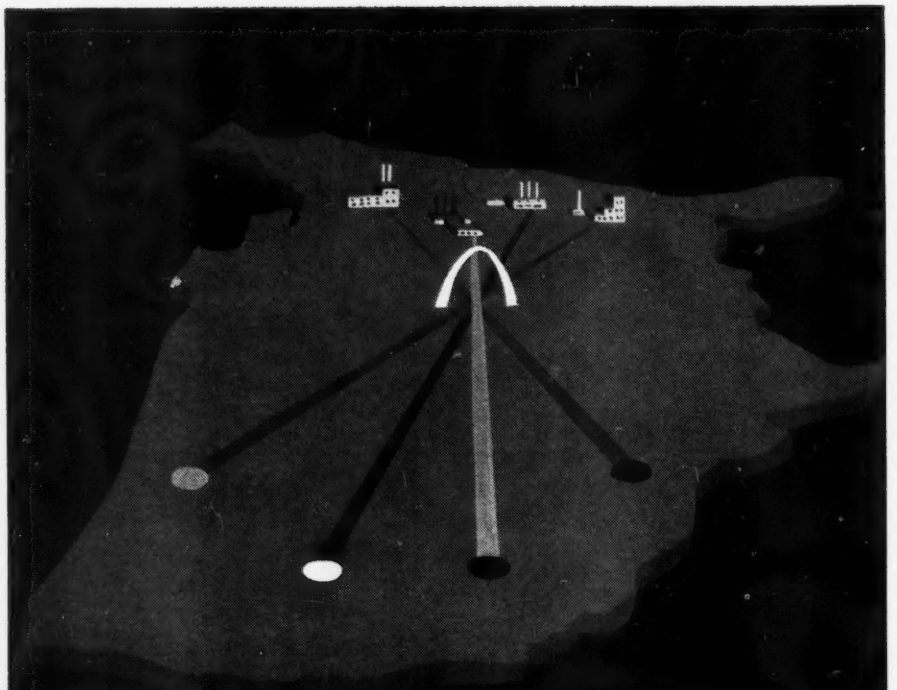
unvented wall heater is a leader almost overnight! Rated at 10,000 BTU, the "Clip-on" is just right for bathroom, bedroom, utility room, kitchen, small office, or any other small space. Available in white or famous Dearborn coppertone. Features cool safety cabinet, Hi-Crown cast iron burners, forward heat flow, stainless steel radiant, pilot light and delightful beauty of appearance. Destined for tremendous volume.



From the superb new Sealed-Vent, the beautiful Regency, and the smart new Crest series to the smallest new star, the "Clip-on" wall heater, Dearborn is the standard of quality among gas area heaters. With improvements and new products being introduced as part of Dearborn's *Quality-In-Action* 1959 program, every Dearborn dealer is assured of greater profit. More than ever, in 1959, you'll be glad you're selling Dearborn!

Dearborn® **STOVE COMPANY,** DALLAS, TEXAS

Regional offices: Dallas, Chicago, Los Angeles, San Francisco, and Atlanta



THE SMARTEST DISTANCE BETWEEN TWO POINTS!

. . . is through the St. Louis Gateway at SPI.

Existing railroad tariffs permit shipment of your pipe from the mills to your destination in most states west of the Mississippi River and some states east of the Mississippi River on "Through Rates" with stopover at our plant in St. Louis for coating and wrapping.

Here is the **one** plant designed and built to execute Standard Procedures that assure you the finest quality coating and wrapping. Here is the **one** plant with machines, methods and management always present to see that Standard Procedures are constantly followed.

Regardless of your pipe's destination in our territory, the smartest route is through the St. Louis Gateway at SPI.

Write for our new catalog.

Contact Our Nearest Representatives
C. J. ARNBRECHT, Jr., 5315 Sandra Way, Arvada, Colo.
R. W. KINKER, 712 Main St., Grinnell, Ia.
A. P. BAKER, Jr., Box 2429, Midland, Tex.
ROGER HORNBOSTEL, 759 Houston St., Memphis Tenn.
BASIL SHARP, 5763 E. 26th Place, Tulsa, Okla.

standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MO.

Personals

E. R. Carey

J. P. Lord

● **E. R. Carey,** manager of general markets sales, has been promoted to assistant sales manager, regular products, of Dresser Manufacturing Division, Dresser Industries, Inc. **John P. Lord,** formerly business manager for welding fittings has been promoted to manager of general markets sales succeeding Carey.

● Hays Manufacturing Company has appointed **Paul E. Cook** as junior salesman in the Michigan territory, and **Frederick S. Willson** as sales representative of the general products division in the Illinois-Indiana-Kentucky territory.

● **R. J. Ulvestad** has been named top district sales manager of the Permaglas division of A. O. Smith Corporation. The division is a leading producer of commercial and domestic glass-lined water heaters.

● Fisher Governor Company's sales representative, The R. S. Stover Company of Marshalltown, Iowa, has opened a district officer in Omaha, Nebraska, headed by **Virgil Jansen.**

● **John E. Daugherty,** former export sales engineer in the international department of Robertshaw-Fulton Controls Company, has been named sales manager, international department.

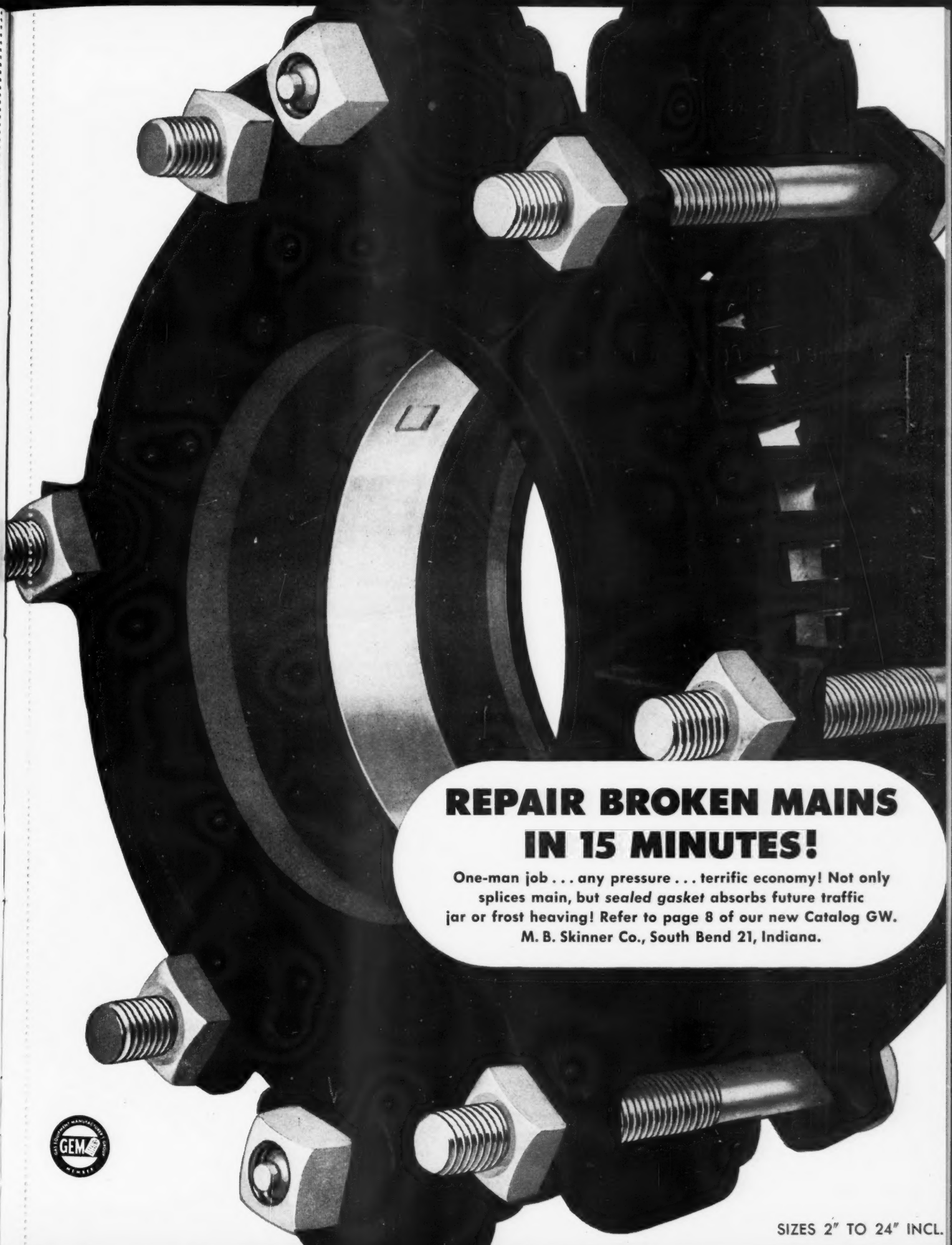
● **Ralph A. Purcelli,** executive assistant to the general manager of Rockwell Manufacturing Company's Barberton, Ohio, plant, has been named general manager of the company's Porterville, California, plant.

● **E. W. Murray** has been named district sales manager for Robertshaw Thermostat Division, Robertshaw-Fulton Controls Company, with headquarters in St. Louis.

● **William B. Poor** has been elected senior vice president of Ford, Bacon & Davis, Inc. Previously he has been vice president and manager of the construction department of the company.

● Dearborn Chemical Company, manufacturers of protective coatings, has elected two new directors, **Paul L. Fentress** and **Joseph E. Rich,** to bring total board membership to nine. Fentress is vice president and director of Baker Fentress Investment Company and Baker Fentress Company, and Rich is president and director of Morton Chemical Company.

● **Richard A. Formato** has been appointed sales manager of the southeastern division of Carlon Products Corporation. Previously, he was a Carlon sales representative in Virginia, Maryland, and the District of Columbia. **Robert D. Pettit, Jr.** succeeds him in this territory.



REPAIR BROKEN MAINS IN 15 MINUTES!

One-man job . . . any pressure . . . terrific economy! Not only splices main, but *sealed gasket* absorbs future traffic jar or frost heaving! Refer to page 8 of our new Catalog GW. M. B. Skinner Co., South Bend 21, Indiana.

SIZES 2" TO 24" INCL.

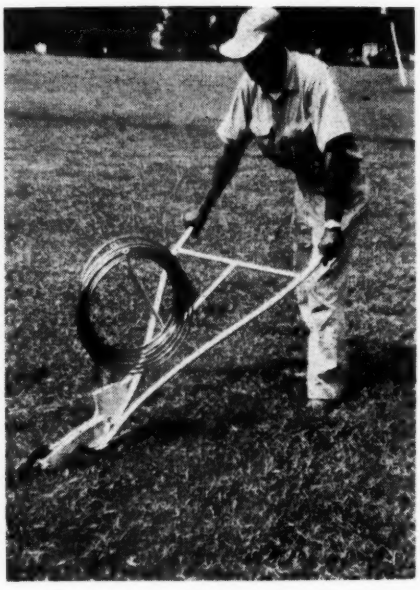
SKINNER-SEAL SPLIT COUPLING CLAMP

Ideas At Work

Here's a collection of 21 ideas suggested by men throughout the gas distribution industry . . . ideas that you can adapt to your operations

Tubing Plow Speeds Gas Light Installation

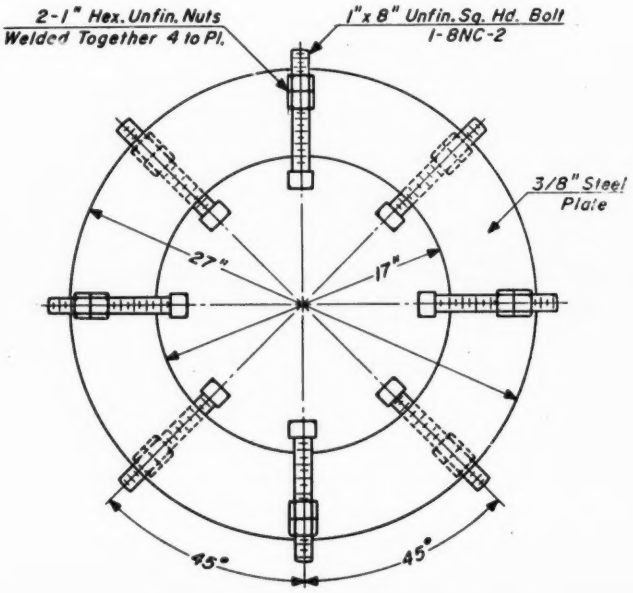
Laying copper tubing fuel line when installing gas lights can be made much easier with the tubing plow developed at Nashville Gas Company. The device, reports Elmer Henson, gas engineer, greatly reduces the time required to lay the fuel line, speeds installation of gas lights, and contributes to a substantial saving in installation costs. The plow, shown in the accompanying photos, is made of ½-in. steel plate with 1/16-in. gussetts on each side, and is fabricated so that ⅜-in. copper tubing will pass through the blade. A bracket holds the roll of tubing. A winch truck is used to pull the plow through the ground. In sandier soils, the plow can be pulled with a garden tractor.



IDEAS AT WORK IDEAS AT WORK IDEAS AT WORK IDEAS AT WORK IDEAS AT WORK IDEAS AT WORK IDEAS AT WORK

Pipe "Jack" Rounds Out Out-of-Round Pipe

Laying a 30-in. main, a construction crew for Boston Gas Company was having difficulty in making pipe ends meet. R. S. "Bob" Lynch, crane truck operator, was witness to their problem and decided something could be done about it. The alignment problem was due to out-of-round pipe ends and use of common jacks to correct the condition was only moderately successful and quite time consuming. Lynch conceived the idea of a series of eight little "jacks" consisting of bolts mounted on a simple washer-type ring. The device was readily fabricated in the utility's welding shop and soon became a valuable addition to its construction equipment. The steel ring fits loosely inside the pipe and its eight evenly space "jack" bolts provide sufficient thrust to true up the ends of the pipe and permit ready alignment for welding or installation of mechanical couplings.



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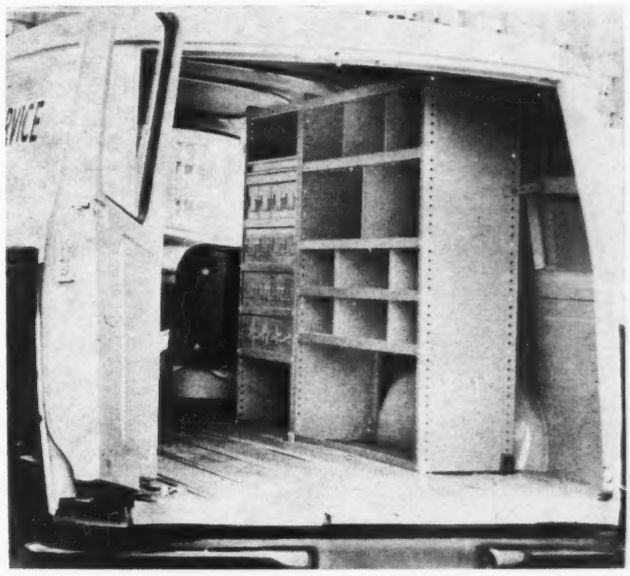
Use That Wasted Space in Panel Trucks!

Space over the rear wheels of service trucks, once considered "wasted space," can be utilized to provide low cost, compartmentalized storage for such items as tools, spare parts, supplies, and equipment. Key to the method is to use sectional steel shelving that is held firmly in place by anchoring clips that secure racks to the truck wall and floor. For storing larger and heavier items a front angle across the floor-level opening can hold these pieces in place. One line of commercially available shelving offers drawer units for small tool or parts storage.



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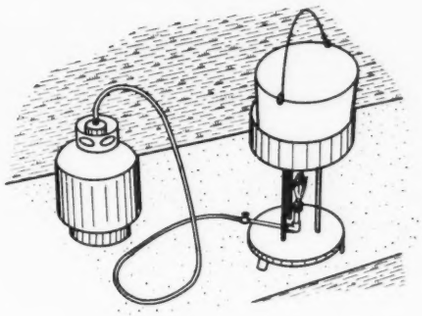

Small Melting Pots for Small Repair Jobs

Service crews and street crews often have small repair jobs to make on coated mains, involving repair of the coating. To expedite such repair jobs and to keep from having to haul heavy or cumbersome heating equipment for heating a small amount of enamel, one company is now using a small but highly useful miniature melting pot. Unit consists of a butane gas burner in which a small pail can be placed. Fuel is supplied through a flexible line from a small pressure vessel. Equipment easily fits into compartment of service or crew truck.

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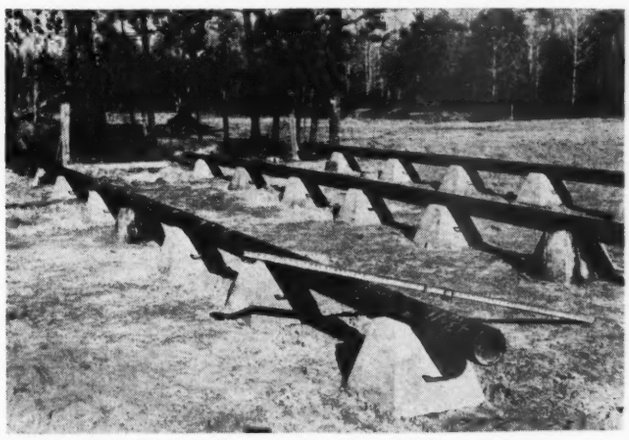
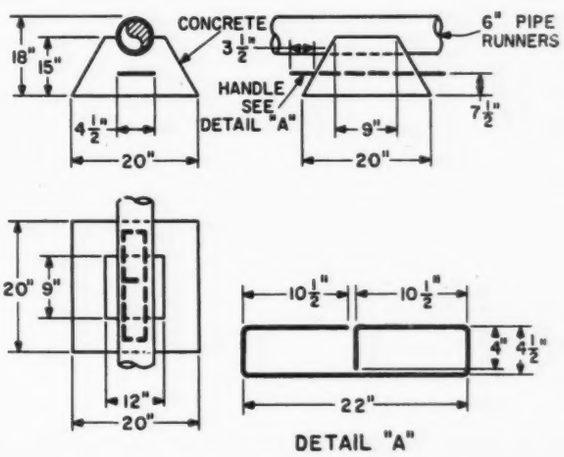
Portable Pipe Rack Proves Practical

Whenever the need arises to store pipe at a temporary location, the portable pipe rack shown in the accompanying drawing and photographs can be used to good advantage. The design shown here was developed by Texas Eastern Transmission Corporation, for use with larger size pipe. The basic idea, however, can be adapted for fabrication of the component parts to accommodate any size of pipe by merely making the required changes in dimensions. Fabrication is simple, and can be done in company shops. While the design is particularly adaptable to temporary pipe storage uses, the racks can also be installed permanently.





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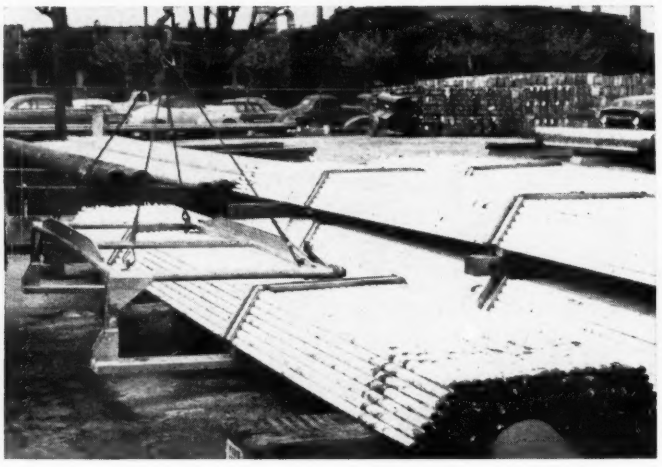
Pipe Cradle for Standard Bundles

To speed pipe handling in the yard — particularly with standard pipe bundles — the pipe cradle shown in the accompanying photos can easily be constructed from structural aluminum. It is particularly useful with a mobile crane when a fork lift truck is not available.



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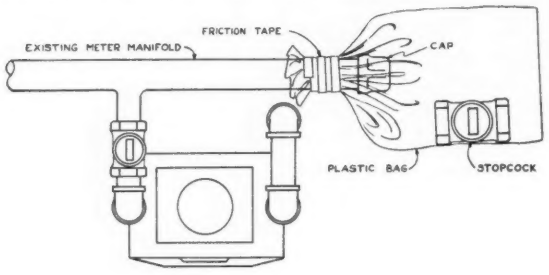
Plastic Bag for Extending Meter Manifold



A plastic bag — made of transparent vinyl of 0.010-in. thickness — can be efficiently used to extend the manifold on an existing multiple meter set assembly without interrupting service to other customers. This is accomplished by taping the bag over the end of the manifold and, working through the bag, remove the cap on the header and replace it with a stopcock. The bag is 10-in. wide by 18-in. long and can be used to install a stopcock as large as 2-in. Pressure limitation on the bag is 12-in. w.c., and each bag should be used only once. Heavier gage plastic material for higher pressures conceivably could be used, but should be thoroughly tested before put into practice.

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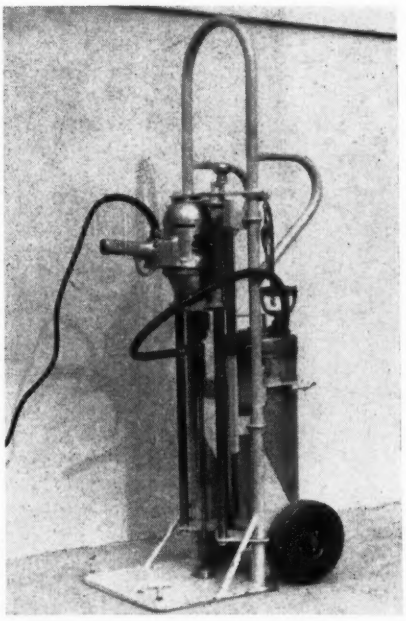
Portable Drill for Bar Test Holes in Sidewalks

This portable electric drilling unit is used on leakage surveys of services in business districts for making permanent bar holes in concrete sidewalks, driveways, etc. Unit drills a ½-in. hole through the concrete. After leakage tests are made, a removable rubber plug is driven into the hole, preserving it for future use. Unit consists of a ½-in. heavy duty electric drill, a diamond tip core drill, and a pressurized water tank, mounted on a two-wheel hand truck. Power is supplied by a portable 120-volt generator driven by a small gasoline air-cooled engine.



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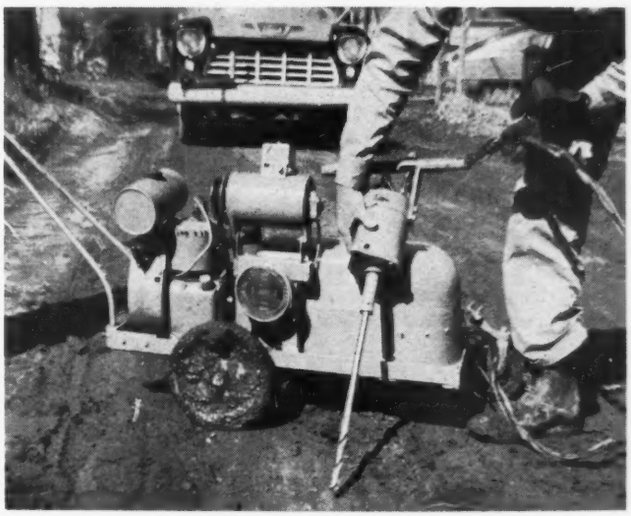
Power Drill Simplifies Bar Testing

A power-driven drill, built during spare time from salvaged materials, is helping Kansas Power and Light Company's Great Bend Division to achieve considerable savings in manhours on bar testing of gas lines. The electric drill method, developed by KPL gas servicemen C. J. Nichols and O. P. Callaway, replaces a post driver rod method. The drill will make a hole in nearly any surface in about 8 seconds. After the hole is drilled, the bar tester may be easily inserted. As many as 100 holes per hour can be drilled. The drill bit is welded to an extension, making a total length of 18-in. The Carbolay tip drills through blacktop, hard sanded surfaces, or any tightly packed earth, cleaning the hole as it drills. As shown in the photo, power for the drill is supplied from a small 15-amp. generator, connected to a ½-hp gasoline engine, mounted on an old lawn mower base with three wheels.



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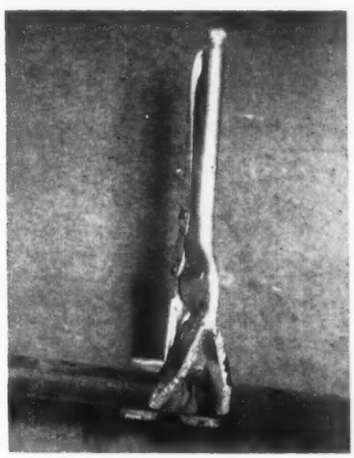

Lever-Grip Line-Up Clamp for Small Pipe

Useful tool when welding together lengths of small pipe and when making tie-in welds in this lever-grip line-up clamp. As shown in photo, clamp is in place, holding pipe in alignment. Action is such that it is unnecessary to hold the clamp once it is attached to the pipe ends. It can be quickly installed, removed, and adjusted to accommodate pipe sizes ¾ through 2-in.

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Slip-On Covers Protect Pipe Ends

Pipe that has been cleaned in preparation for coating and installation sometimes must be stored overnight or over a weekend — and this presents a problem in how to keep it in good condition. Gas distribution company construction men have taken a cue from the oilwell drilling industry and adapted a slip-on pipe end cap to provide such protection. The slip-on ends, commercially available, are molded from synthetic material that has elasticity to provide a tight seal and ample length to give good protection.

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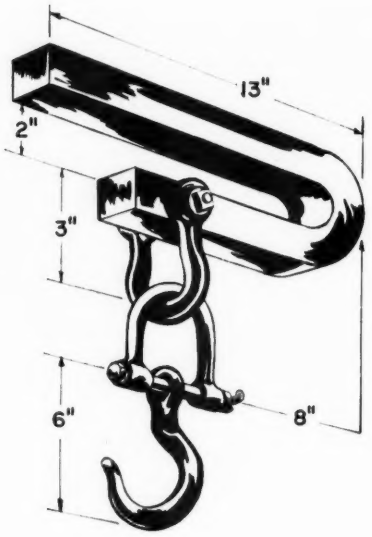
Bucket Hook Increases Front End Loader Versatility

Front-end-loader equipped tractors, widely used in gas distribution construction and maintenance, can be made even more versatile with this handy hook assembly, which can be attached to the loader bucket. By means of the hook, the loader can be used for lifting and positioning manhole castings and pipe, and for removing lagging. While the hook itself is not recommended for use in transporting any laying pipe — which would result in damage to the pipe coating — it can be used with pipe slings. Utilization of this simple device, suggested by Glenn Lundt of Pacific Gas and Electric, San Francisco, permits operation of mechanized equipment, when it might otherwise be idle to perform tasks ordinarily handled by other machines or by hand.



Dry Ice, Inner Tube Solve Difficult Problem

Often during the installation of a gas main it is necessary to cross water service lines and in some cases these water service lines have to be cut. If the section of water service line to be crossed lies between the main and a shut-off (curb box or meter, etc.) the problem of cutting off the water flow can be messy. One solution to this problem is to use the dry ice-alcohol method, freezing the water in the line on both sides of the cut. If the section to be cut out must be left open for a period of time, the open ends can be plugged.

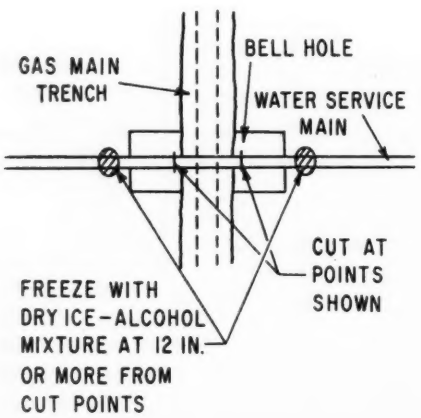
The dry ice method is quite simple — all that is needed for each side is a piece of old inner tube about 8 to 10-in. long, two wide paper clamps, a supply of dry ice, and a supply of rubbing alcohol (you can use anti-freeze or gasoline, too). The inner tube is centered under the pipe and brought up and fastened with the clamps. The tube should be allowed to bulge a bit in the middle to form a pocket around the pipe. For freezing a ¾-in. pipe, a piece of dry ice the size of a tennis ball (about 1-lb) is sufficient. Put it in a cloth, pulverize with a hammer, and dump contents into the rubber pocket. Add about ¼ pint of alcohol and stir the mixture to make a wet mush. This mush is very cold and makes such good contact with the pipe that the water inside is quickly frozen.

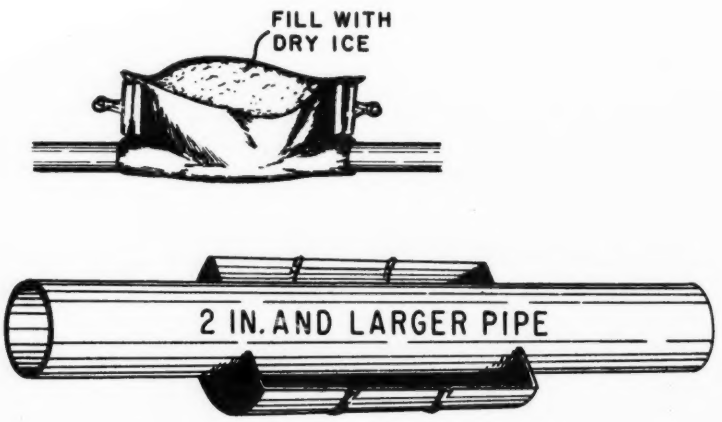
Water in the pipe will generally freeze in two to five minutes. (Be sure to use alcohol or similar liquid — otherwise it will take as long as 30 minutes to freeze the water in the pipe.)

Generally, it is best to wait 10 to 15 minutes before cutting the pipe, to insure that the water is frozen solidly. Points at which the water is frozen should be 12 to 18-in. back from the ends at which the pipe section to be removed is to be cut.

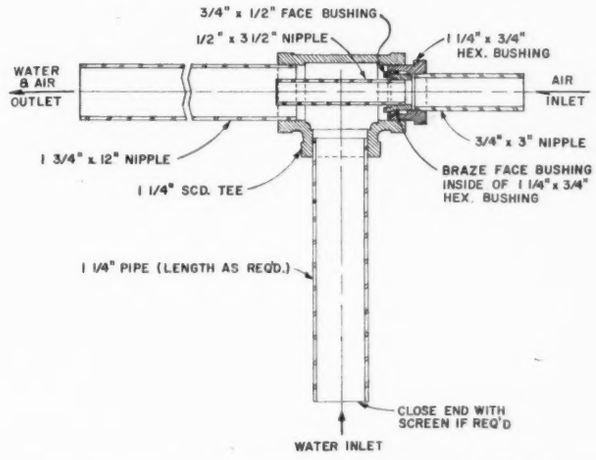
The method described above will work on pipe sizes up to about 2-in. if flow is not too great. For larger pipe sizes, a similar method can be employed using a larger "pocket" made from an oil can or similarly large container and using larger amounts of dry ice and alcohol or gasoline, as shown in one of the accompanying sketches. Caulk the ends where pipe rests in the cutout sections.

When the pipe section is to be restored, the service line ends can be frozen again, pipe plugs removed, a new pipe section welded or clamped into place, and a torch or warm water can be utilized to thaw the pipe.


GAS MAIN TRENCH
BELL HOLE
WATER SERVICE MAIN
CUT AT POINTS SHOWN
FREEZE WITH DRY ICE-ALCOHOL MIXTURE AT 12 IN. OR MORE FROM CUT POINTS



Inexpensive Air Powered Siphon

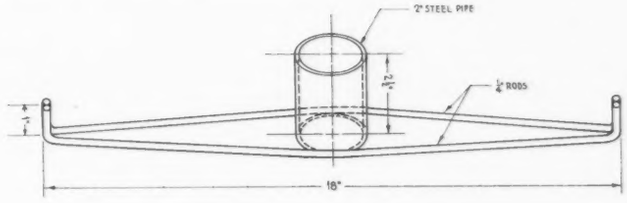

3/4" x 1/2" FACE BUSHING
1/2" x 3 1/2" NIPPLE
1 1/4" x 3/4" HEX. BUSHING
WATER & AIR OUTLET
AIR INLET
3/4" x 3" NIPPLE
1 3/4" x 12" NIPPLE
BRAZE FACE BUSHING INSIDE OF 1 1/4" x 3/4" HEX. BUSHING
1 1/4" SCD. TEE
1 1/4" PIPE (LENGTH AS REQ'D.)
CLOSE END WITH SCREEN IF REQ'D
WATER INLET

About $2 worth of standard pipe and fittings is all that's needed to construct this air operated siphon for pumping small amounts of water from valve, boxes, or regulator and filter vaults, seepage water from bell holes, or other small volumes of water. Can be constructed easily and inexpensively in any gas utility shop. When attached to an air compressor, the standard 115 psi pressure is more than enough

to make quick work of removing water. This device, developed by Roger Gamble of Northwest Natural Gas Company's Distribution Department, is not intended to replace an engine-driven pump for removal of large volumes of water, but it is much faster than a drip pump for small amounts.

Holder Adds Safety to Jackhammer Operation

Here's a handy, easily fabricated device that adds safety to the job of starting jackhammer drill bits. The holder is held in place by the operator's feet until the drill has started and at the same time keeps the operator's feet in the clear in case the drill steel should break. Device is easily fabricated; can be welded from ¼-in. rods and a short length of 2-in. steel pipe.

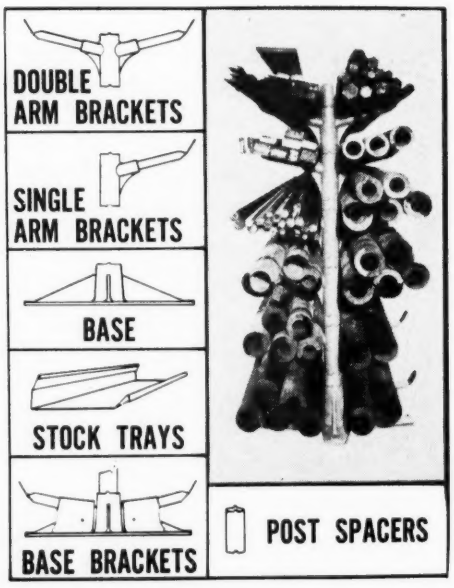


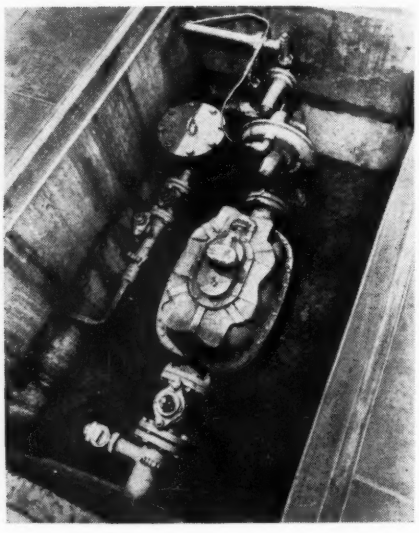
Extension Arm for Pipe Unloading

Constructed of 4-in. channel iron and designed to be bolted to a Payloader bucket, this handy device saves the expense of having another piece of heavy equipment available for unloading pipe from gondola cars or trucks. The extension arm can be bolted to the bucket or removed in about five minutes.

Various Size Pipe Stacked on One Storage Rack

Here's a new idea in storage racks for pipe, tubing, and miscellaneous fittings that allows the user to combine sectional components into a storage rack meeting his requirements. The sectional parts, available commercially, include double arm brackets, single arm brackets, stock trays, bases, base brackets, and post spacers that fit easily onto 2, 2½, or extra-heavy 2½-in. pipe lengths (available around most distribution company shops and yards). This do-it-yourself equipment allows the user to assemble racks in a variety of forms to accommodate pipe of all diameters and lengths.



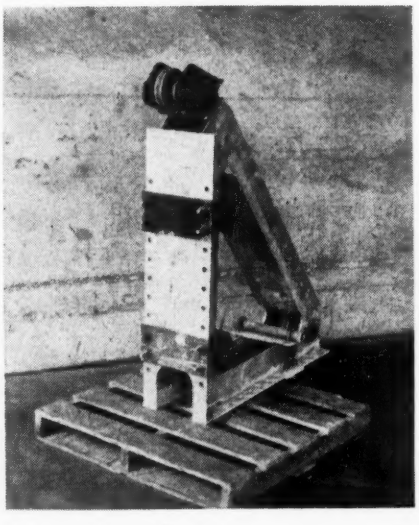


Pre-Cast Pits for Meters, Regulators

Pre-cast concrete pits or vaults that can be placed in the sidewalk, parkway, or similar areas provide easily accessible yet almost unnoticeable installations for large meters or regulator installations. The pits are easier and quicker to install and are generally more economical than other methods, in addition to being "better looking" than above ground installations. One pit of this type, commercially available, measures 4 ft wide by 7 ft long and in depths of varying dimensions. Lightweight, non-skid steel cover sets flush with sidewalk, eliminating danger of tripping. When used with large meters, the meter can be read by merely lifting a small lid in center of the cover. With cover off, a service man can easily get into the pit to work on the meter or regulator. Pit is easily set in place in a half day, and can be easily cleaned.

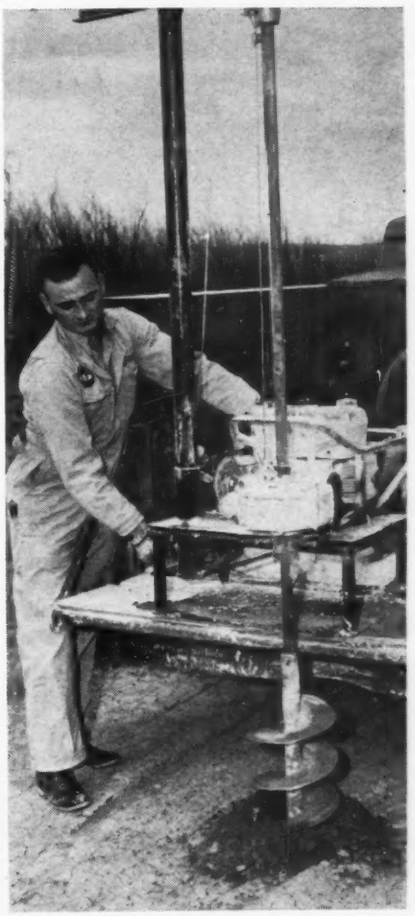
Cable Diverter Speeds Pipe Pulling

Whenever pipe must be pulled through a bore or casing, this cable diverter can be used to speed the operation. It provides a method of transferring the cable from the bottom of a bell hole to the drum of a power winch mounted on the front of the truck. Trench jacks are used for securing the cable diverter in a bell hole. Made of aluminum, the unit weighs 165 lb. Of this weight, 43 lb is found in the demountable swivel head, which can be conveniently removed while the diverter is being moved into the bell hole, off the truck, etc. The swivel head makes it possible to locate the power winch at any convenient point around the bell hole.



One-Man Auger for Anode Installation

Hand digging holes for installation of anodes is a time-consuming and tedious operation. Engine-driven earth augers are available that can do the job quickly and easily but they usually require two men for their operation. Corrosion technician Paul Coor of Southern Union Gas Company in Carlsbad, New Mexico, came up with a device of his own design that can be operated by one man and is simple to build. Coor adapted some of the principles of the rotary drilling rig to a small earth auger. With a little work done by a local machine shop, he mounted the auger on the end gate of a pickup. Main parts of the assembly are the auger and a winch and crane, which are mounted on a small stand attached to the pickup end gate with four bolts. The equipment can be installed or removed from the truck in five minutes.



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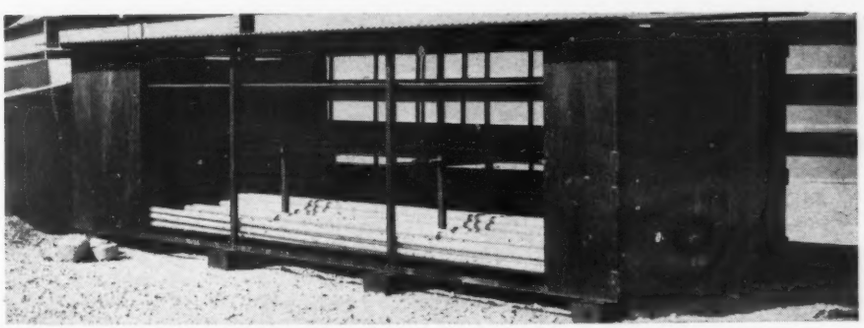
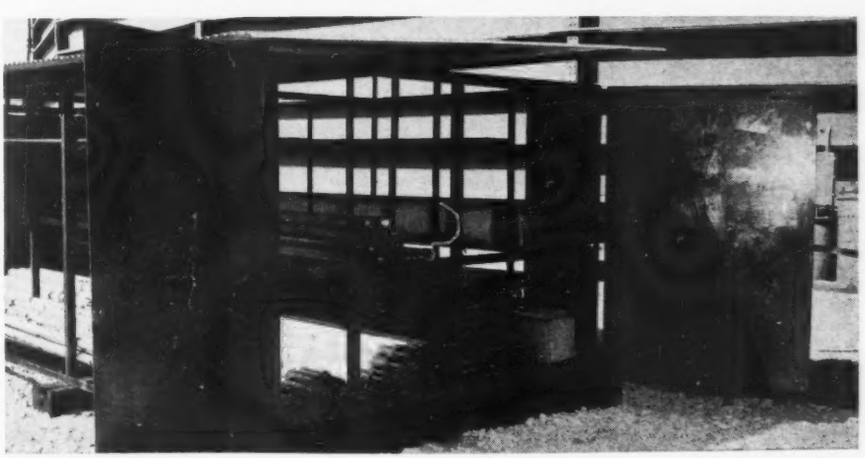
Rack for Small Pipe Can Be Locked for Security

A rack for outside storage of steel, copper, or plastic pipe that can be locked for security has proven very satisfactory in use at Peoples Gas Light and Coke Company, Chicago, reports H. E. Wade, general storekeeper. The rack, intended mainly for use with pipe in sizes ⅜-in. to 6-in., is constructed with cross bars and dividers of ¼-in. by 2-in. or ⅜-in. by 2-in. angle iron with 2-in. by 6-in. channel iron at corners and is of welded construction. Plate steel is used at the back, front, and rear of both sides to prevent unauthorized removal of pipe. Either or both ends can be fitted with hinged doors and clasps to facilitate pipe loading and unloading.





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Electricity directly from heat energy

Thermoelectric Devices: Tomorrow's Competition?

Dean Hale,
Editor

DIRECT HEAT-TO-ELECTRIC ENERGY CONVERSION now being studied by researchers in many quarters will have tremendous impact on the gas industry when and if it is developed enough to become commercially useful.

As pointed out in the AMERICAN GAS JOURNAL'S special report on *The Century Ahead* in the January 1959 issue, radical changes in energy conversion methods offer a big challenge to the gas industry. The basic industry that today takes the proverbial "bull by the horns" stands a good chance of becoming the leader in a new industry with a new concept for providing the nation's energy requirements.

With hard-headed realism, it must be realized that use of electrical power will continue to grow at an even faster pace than other forms of energy. As our fossil fuel reserves decline in coming years, new ways of supplying energy must be found.

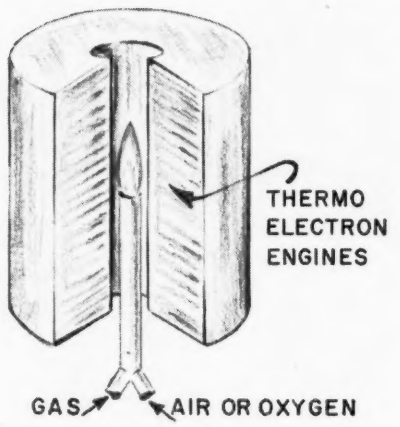
Today, most electric power is supplied through indirect energy conversion — by using fossil fuels (gas, oil, coal) to provide heat energy, which is converted to mechanical energy in a turbine. This energy is then converted from mechanical energy to electrical energy by using generators. Indirect conversion, theoretically, is not an efficient method of producing power — today's modern steam-electric generator plants operate at efficiencies of 30 to 40 percent — yet, it remains the only practical method for large scale power generation.

Direct Conversion Methods

Basically, there are three methods for converting certain energy directly from one form to electrical energy. These are:

1. **Electrochemical.** Common examples of this method are the battery, a primary method, and the fuel cell, another primary method. The battery has the disadvantage of "using itself up." The fuel cell is still in the developmental stage but holds great promise (see article on *Fuel Cell: Friend or Foe?* in February 1959 AGJ).

2. **Thermoelectric.** Common example of this method are thermocouples (as used in control and sensing devices) which consist of two dissimilar metals joined together that produce an electric current when one of their junctions is heated. Similar to these devices are the thermogalvanic cells.



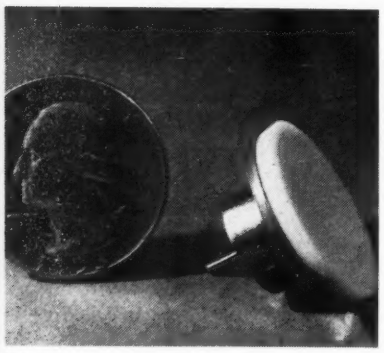
Thermo-Electron Engine offers the most promise of the current developments for the direct conversion of heat to electricity.

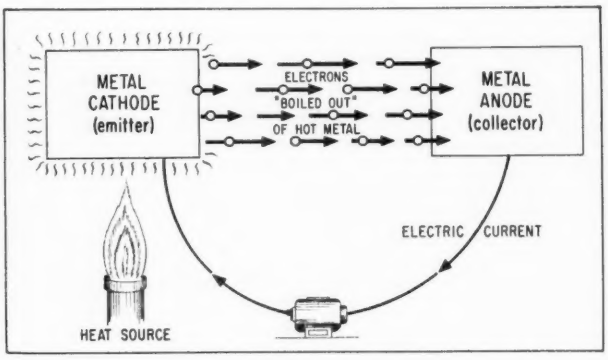
3. **Photoelectric.** Common examples of this method are the photoelectric cell (electric eye) and the solar battery.

Of the three, the most promising today are the fuel cell and the thermoelectric generator.

Thermocouples and Thermogalvanic Cells

The **thermocouple** has been used for many years in measuring temperature differences. However, one of the great difficulties in improving thermocouples so they can be used commercially is to find materials that are good electrical





◆ **New high vacuum thermionic converter,** made of metal and ceramic, is the size of a quarter. Device invented by James E. Beggs works at a much lower temperature (1500 F) than the gas-filled converter.

Dr. Volney C. Wilson inspects one of his experimental thermionic converters that converts heat directly into electrical energy with "encouraging efficiency." ◆

conductors but poor conveyors of heat. These properties, along with the "thermoelectric power" determine a figure of merit for thermocouple materials. Another problem arises because of changes occurring in metals when they are used at high temperatures — certain combinations may appear promising but when subjected to high operating temperatures, diffusion, phase changes, and other effects, their properties completely alter.

A **thermogalvanic cell** consists of two similar electrodes maintained at different temperatures and separated by an electrolyte.

This system is based on a difference in thermoelectric power of the electrodes, which produces a voltage across the electrolyte. A transfer of charge is produced by a transfer of atoms through the electrolyte from one electrode to the other. As an atom enters the electrolyte it gives up an electron and as it arrives at the opposite electrode it accepts an electron. This charge transfer can be used in an external circuit to perform work.

The thermogalvanic cell appeared to be promising in the 1880's and much research was done on it then. Efficiencies proved to be much too low for power production, however, and its use has been restricted to theoretical studies and measuring systems.

In the early 1930's, experimenters in Russia and the United States tried to extract electricity from mercury vapor plasma, but again the efficiencies proved to be very small.

Results of some promising current experiments are given in the following discussions.

Thermo-Electron Engine

Invented by Professors George N. Hatsopoulos and Joseph Kaye of Massachusetts Institute of Technology, the thermo-electron engine utilizes two plates separated by a vacuum. It requires plate materials that yield many electrons when heat is applied and a very small separation between plates. One of the plates is kept at a much lower temperature than the other.

The gas-heated thermo-electron engine is described as economical and safe in operation, and is simple to construct and maintain. A box of one cubic foot volume, containing several small thermo-electron engines, is estimated as being able to supply enough electrical power for the average home of today. It can use natural gas, manufactured gas, or bottled gas.

Experimental models of the device have yielded efficiencies up to 13 percent. Efficiencies up to 30 percent yielding 20 watts per sq in. or 3 kilowatts per sq ft may eventually be obtained. Further development work on the device is being undertaken by the Thermo Electron Engineering Corporation of Cambridge, Massachusetts.

Radioisotope-fueled thermoelectronic generator weighs 5 lb can produce up to 5 watts power. Model at right is in operation, produces enough power to run small motor driving miniature propeller. At left is device without its shielding cover. —*UPI Telephoto*

The Thermionic Converter

Developed at the General Electric Research Laboratory by Dr. Volney C. Wilson, the thermionic converter was first publicly revealed in late 1957. Dr. Wilson's invention combined several known scientific principles in a unique manner. The tube-like device uses two electrodes — an anode and a cathode — that are maintained at high — but different — temperatures. **The thermionic converter differs from an ordinary thermocouple in that the metals used are separated by a cesium vapor gas at a very low pressure.** This has the advantage of electrical flow between the electrodes, but with less flow of heat than through a metal. Thus, the electrodes can be at different temperatures, greatly increasing the efficiency. Dr. Wilson's invention was described as purely experimental.

In Wilson's foot-long glass tube device, the cesium vapor partially ionizes, neutralizing the space-charge effect that might otherwise block the flow of electrons from cathode to anode.

Equally important, the cesium coats the electrodes, thus affecting their work functions (the amount of energy that must be used in order to free an electron from the electrode and release it into the surrounding space). The difference between the work functions of the cathode and the anode is the key to successful operation of the thermionic converter. This difference provides the voltage that drives the electrons through the circuit.

Internal resistance of the converter is reduced in several ways. One is by using a partly ionized gas. The other is to place the electrodes close together, the method used by Dr. Wilson.

Just over one-half year later, the GE Research Laboratory announced development of a working model of a thermionic converter using a new principle.

This new device, invented by James E. Beggs, is a combination of metal and ceramic disks surrounding a high vacuum — about the size of a quarter — that produces an electrical current when heated. It works at a much lower temperature (1500 F) than the gas-filled converter (3000 F), which makes material requirements easier to meet. Converters of the type developed by Beggs are estimated to be able to operate in the 1 to 10-watt range. No details have been released on the materials used in the Begg's device.

Radioisotope-Fueled Thermoelectric Generator

Most unusual of the many thermoelectric devices to appear to date is the radioisotope-fueled generator developed by Minnesota Mining and Manufacturing Company in association with the Martin Company.

The device, called a "pocket" nuclear electric generator, weighs five pounds, and was developed for use as a power source for radio equipment and instruments in U. S. satellites and space-probing devices.

In the center of a 4¾-in. cylinder, space is allowed for the heat source. Around the inner cylinder are 20 pairs of lead telluride rods in V-shapes, with

(Continued on page 54)

Hi-Btu Gases from Fluid Fuels

Present and Future Methods

Part 4 — Continuous Thermal Cracking

Henry R. Linden, *Research Director, and* **Martin A. Elliott,** *Director, Institute of Gas Technology, Chicago, Illinois*

Fluid-bed Cracking

Oil gas has been produced in a fluid-bed cracking unit (3 gal per hour pilot plant) similar to the fluid catalytic cracking equipment used in the oil industry.

As shown in the flow diagram, Fig. 6, oil is contacted with hot, finely divided solid particles (heat transfer medium) in a bed maintained in the fluidized state by an upward flow of steam and oil vapors. Thermal cracking on the surface of the hot solids yields the normal distribution of gaseous and nongaseous products, wtih coke being deposited on the solids.

Vapor-phase cracking products are withdrawn from the generator vessel overhead and passed through condensation and separation equipment. Coke-covered solids are continuously transferred from the reaction zone to a regenerator vessel located adjacent to the generator, where deposited coke and supplemental fuel are burned to reheat the solids for feed oil vaporization and cracking.

To complete the cycle, regenerated solids are returned to the generator to be contacted with fresh oil feed. Solids conveyance between the two vessels is accomplished pneumatically or by gravity, or by a combination of these methods.

Heat transfer medium used in the process was 30-mesh silica gel, at circulation rates generally ranging from 5 to 20 lb per lb of feed oil. Other materials that resist attrition, such as granular refractories, silica-alumina, and high-temperature coke breeze, are satisfactory, since – unlike fluid processes used in refinery operations — the heat transfer solids are not depended upon for any catalytic effect at the elevated temperatures necessary for oil gasification.

Distillate and premium residual feedstocks can be utilized in the fluid-bed gasification process. The use of low-grade residual oils would require further development of the oil feed system to prevent agglomeration of heat transfer solids from excessive pitch and coke formation at the point of oil introduction.

Fluid-bed gasification has the advantages of continuous coke removal, and continuous production of high-Btu gas with no flue gas dilution. High severities of cracking can be achieved at relatively low temperature levels, since heat transfer is more rapid in a bed of hot fluidized solids than on cyclically heated stationary refractories. This permits the production of low specific gravity oil gases of greater substitutability for natural gas. The absence of cyclic temperature variations and large temperature gradients improves process control, and eliminates partial overcracking and undercracking typical of cyclic operation.

Results from gasification runs on diesel oil, reduced crude, and No. 5 fuel oil are equivalent to those presented in Table 8. Estimates of equipment costs indicate that only very large fluid bed units would offer any savings over conventional cyclic equipment.

Thermofor Pyrolytic Cracking

High-temperature thermal cracking of residual oils in a moving bed of ¼ to ¾-in. diameter coke pebbles has been investigated by the Surface Combustion Corporation in a pilot plant (Fig. 7) of about one bbl per hour capacity.

In this process, originally developed by the Socony Vacuum (now Mobil) Oil Company for a moving bed of refractory pebbles, oil is introduced into the bottom of a moving bed of hot coke pebbles, where pyrolysis takes place to produce oil gas and the usual by-products. The pebbles flow downward through the reactor by gravity, while the oil vapors flow counter-currently upward at velocities too low to establish fluidization. Coke laid down during the pyrolysis step increases the weight of pebbles in the system. Coke is, therefore, continuously withdrawn from the system in the form of fines and oversize pebbles.

Cracking products are withdrawn through a pebble quench which cools them to a temperature at which coke and pitch deposition problems are minimized. To provide for this pebble quench, a side stream of solids is diverted from the circulation system at the top of the pneumatic lift, which is the coolest point in the system. After passing through a heat exchanger where the temperature level is adjusted to 750 to 800 F, the coke is contacted with the cracked products coming off the top of the reactor through a crossover section. After quenching the effluent product

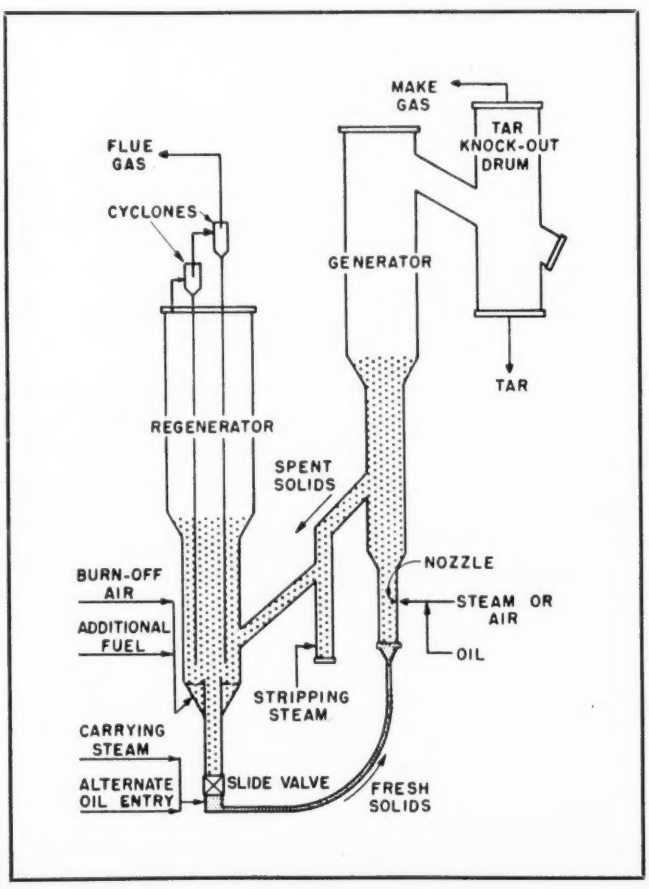


FIG. 6. Simplified flow diagram of fluid-bed pilot unit at Institute of Gas Technology.

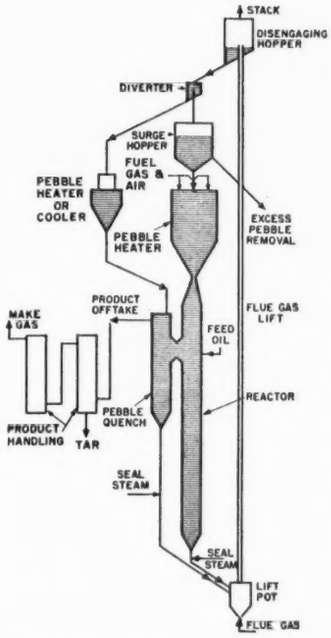


FIG. 7. Flow diagram of Thermofor Pyrolytic Cracking (TPC) pilot unit by Surface Combustion Corp.

stream, the coke is combined with the stream of coke pebbles flowing from the bottom of the reactor.

Coke pebbles from the bottom of the reactor are transferred by means of a pneumatic lift to the pebble heater on top of the reactor. Gas is burned there to reheat the coke pebbles to 1400 to 1650 F. The hot coke flows back to the reactor by gravity to complete the cycle of this continuous gasification process. Oil gas and vaporized liquid products are prevented from circulating with the solids by steam seals.

The TPC process has the advantage of producing gases of good substitutability because of the severe cracking conditions which can be maintained without by-product handling difficulties, and because dilution with high specific gravity combustion gases can be minimized. Compositions of the product gases at equivalent true oil gas heating values correspond closely to those shown in Table 8. Difficulties exist, however, in designing a full-scale plant because feed oil is not readily distributed over the heat transfer medium, due to lack of turbulence. A large number of oil inlets will probably be required to prevent plugging. Heat transfer between the moving bed and the hydrocarbon vapor phase is better than in fixed refractory cyclic operation, but not as rapid as in fluid-bed operation.

Only gas firing of the pebble heater was used in the Surface Combustion Corporation pilot plant. If this is the only practical method of meeting the process heat requirements, relatively low net gas yields and high coke and liquid product yields will be obtained. Oil firing appears to be feasible, however, and meeting all or a portion of the heat requirements by coke burnoff may also be practical.

Economics of the TPC process are highly dependent on by-product credits. As a result of pitch removal during the pebble quench, the highly aromatic liquid products have a low viscosity and a very low free carbon content. The value of the crude liquid products was estimated at 10 cents per gal in a marketing study reported in 1956. Coke produced from the relatively low ash-content oil cracked in the pilot plant studies was shown to meet the specifications for electrode-grade petroleum coke. As a result of the high initial reactivity of the coke laid down on the porous seed coke, approximately 50 percent of the total coke laid down in the pilot plant tests was gasified in the pebble heater. The uncertainty regarding ultimate coke quality introduced by this performance characteristic justifies the assumption of only fuel value at $10 per ton as a coke credit.

Net material and utility costs for the TPC process are shown in Table 14 in comparison with estimated costs for the Hall process with comparable feedstocks. It is probable that the cost of light-oil recovery would be higher for the Hall process, but even if this were taken into account, the net material-plus-utility costs for the TPC process are at best just competitive.

Investment costs for gas or oil-fired TPC cracking units, including tar recovery equipment, gas scrubbers and all necessary auxiliary equipment, were estimated in 1954 as follows:

Size of Plant MMcf/Day	Investment Cost, $/Mcf Daily Capacity Gas-Fired	Oil-Fired
5	280	200
20	200	137.5

Comparable costs for the Hall process are substantially higher because a relief holder, exhausters, and more extensive liquid products handling and separation facilities are needed. As plant capacity increases, the total investment cost for the TPC process increases at a rate much less than that for the Hall process, because scaleup of a single unit is less costly than a multiplicity of cyclic units.

Based on published data, the cost of a comparable 22 MMcf per day Hall plant for operation on Bunker "C" oil would be $255 per Mcf daily capacity. It should be noted that all of these cost estimates are based on the installation of gas-generating and by-product-handling facilities in an existing manufactured gas plant. Site, site improvements, steam plant, general plant buildings, oil and finished product storage, purification equipment, and finished gas compression equipment are not included. Light oil recovery and other gas conditioning equipment not included in the original estimate may also be necessary in commercial TPC operation. It appears that on the assumption of the feasibility of oil firing, the investment cost for a large TPC plant operating on residual oils would be substantially lower than that of an equivalent cyclic plant.

From the foregoing, it is evident that the main economic advantage of the TPC process would be lower fixed costs for large plants. This would be accompanied by the usual savings in labor costs realized in the operation of a single unit having a capacity equal to that of a number of small units.

TABLE 14. Comparison of Raw Material and Utility Costs, and By-product Credits, for Thermofor Pyrolytic Cracking and Hall High-Btu Oil Gas Processes.

Basis: 1000 Btu/SCF Heating Value After Light Oil Removal, 20 MMCF/Day Plant Capacity

Oil Properties						
Type	Reduced Crude			Bunker "C"		
°API	18.5			14.2		
Specific Weight, lb/gal	7.86			8.09		
Carbon/Hydrogen Weight Ratio	7.36			8.02		
Conradson Carbon Residue, wt %	7.9			10.6		
Heating Value, Btu/gal	149,000			151,000		
Unit Prices or Credits						
Oil, cents/gal	8			7		
Liquid Products, cents/gal	10			10		
Coke, $/ton	10			10		
Process Steam, cents/1000 lb (Bunker "C" fuel only)	70			70		
Power, cents/kwh	1			1		
Process Requirements						
Process Type	TPC		Hall	TPC		Hall
True Oil Gas Heating Value, Btu/SCF	1000	1300	1200	1000	1300	1200
Make Oil, gal/MCF	11.9	12.4	12.5	13.2	13.5	14.2
Heat Oil, gal/MCF	2.3	2.4	0.8	2.6	2.6	0.6
Process Steam, lb/MCF*	2.5	2.5	30	2.5	2.5	35
Power, kwh/MCF	2.5	2.5	2	2.5	2.5	3
By-Products						
Liquids, gal/MCF	3.1	4.1	4.2	3.9	4.7	5.3
Coke, lb/MCF	15.0	9.5	—	19.3	13.0	—
Net Material and Utility Costs, Cents/MCF	78	75	69	65	62	56

*Not including steam requirements for light oil recovery.

Thus, with increased by-product credits from the sale of coke at electrode grade prices, the TPC process may be highly competitive with conventional cyclic processes in areas where peak shaving is required in large increments, and where good liquid by-product markets also exist.

Part 5 will appear next month.

Dust In Gas Streams

A REPORT ON SUSPENDED PARTICLES IN GAS SYSTEMS

Part 3-A: Sampling Techniques and Errors

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A NUMBER OF INSTRUMENTS ARE AVAILABLE that characterize in various ways the nature of particles suspended in a fluid media. To do so accurately, however, it is obviously necessary that they act on a representative sample of the suspensoid. In the sampling of a suspensoid flowing in pipe, the instrument is generally located outside of the line and a representative sample must be drawn through a sampling probe to the instrument. The flow characteristics of sampling probes, however well designed, introduce errors in the particulate determination. This chapter discusses the type of errors introduced and recommends procedures that will minimize the errors.

Numerous sampling procedures are employed by the various companies within the American Gas Association. These companies are accumulating information on standardized equipment. If data taken with this equipment are to be directly comparable, sampling procedures must also be standardized whenever possible and any inherent errors understood. In any gas-sampling system there are several possible sources of error. These are illustrated in Fig. 1, which depicts a generalized sampling arrangement.

The major sources of error occur:

A. At the entrance to the sampling nozzle, where the linear velocity may differ from that of the line. This may cause an increase or decrease in the concentration of particles being sampled.

B. At bends in the sampling line, where impaction and subsequent loss of particles may occur.

C. At the walls of the sampling probe, where losses by diffusion of the particles may occur.

D. In vertical sections of the tubing, where the velocity may be insufficient to support the particle.

E. In horizontal sections of the tubing, where particles may settle.

F. Because of the introduction of spurious liquid particles, due to the cooling or heating that accompanies expansion or compression of the gas within the sampling system.

G. Because of the diameter of the probe nozzle.

If the best possible sample is to be drawn, it is essential that these factors and their effects be thoroughly understood.

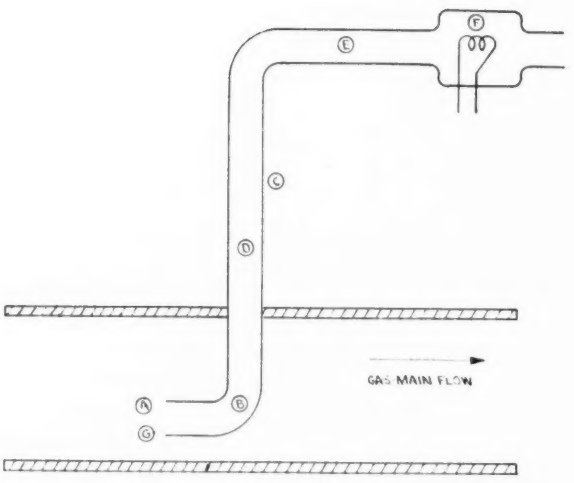

FIG. 1. Possible sources of error in a typical sampling system.

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SOURCES FOR ERRORS IN SAMPLING

Non-Isokinetic Sampling

When a sample is withdrawn through a nozzle from a fluid stream at a rate such that the linear velocity through the aperture of the nozzle is equal to that in the fluid stream, the sample is said to be withdrawn isokinetically. Numerous investigators[1,2,3,4] have found that isokinetic sampling is required to obtain a representative sample of the material in the stream.

The need for isokinetic sampling is illustrated in Fig. 2,

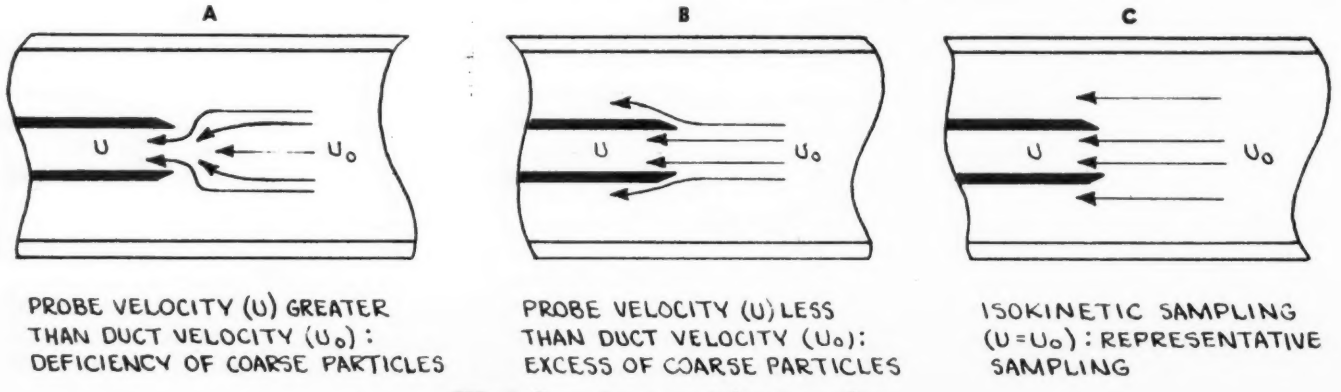

FIG. 2. Errors due to non-isokinetic sampling.

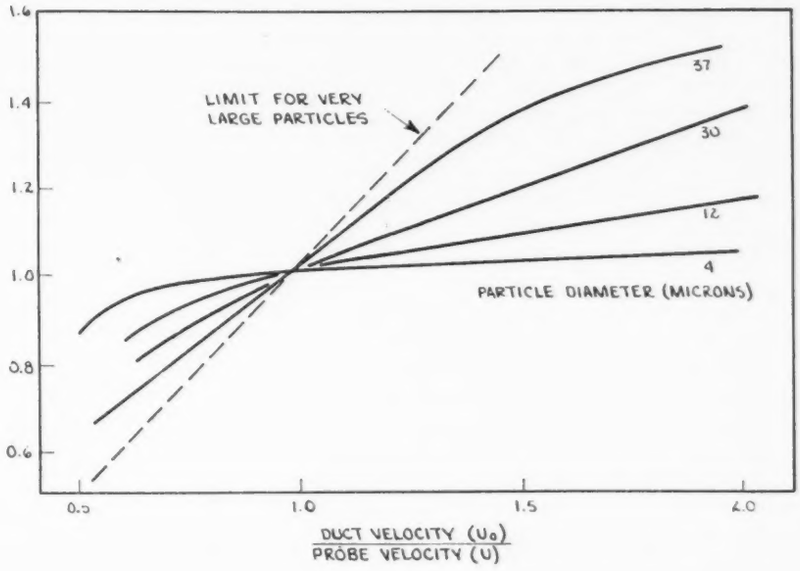

FIG. 3. Effect of non-isokinetic sampling for various size particles based on data of H. H. Watson.

which shows several air flow patterns. In Fig. 2-A, the sample is drawn through the aperture of the sampling nozzle at a velocity that is greater than the velocity of the gas in the stream. The gas sample, therefore, is drawn into the nozzle, causing the flow lines in the main stream to converge toward the nozzle.

Under such conditions, a collection will not contain the proper number of large particles. The large particles, because of their greater inertia, will tend to travel in a straight line. Consequently, such particles will not follow the flow lines into the nozzle, but will tend to cut across them and continue downstream of the sampling point. On the other hand, the smaller particles, because of their lesser kinetic energy and inertia, will follow the flow lines and will be collected in a representative manner.

Fig. 2-B shows the sample being withdrawn at a rate where the velocity through the aperture of the sampling nozzle is appreciably less than that in the main stream. The flow lines in the gas stream diverge around the sampling nozzle. Again, the small particles will follow the flow lines, while the large particles will tend to cut through them. In this particular case, however, a traversal of the flow lines by large particles will cause too many to enter the face of the sampling nozzle. As a result, the sample will contain an excessive number of large particles.

Fig. 2-C depicts isokinetic sampling. It may be seen qualitatively that, under these conditions, a representative sample should be removed from the flowing stream.

The configuration shown in Fig. 2 is for the case where the sampling nozzle is parallel to the lines of flow. In practice, probes are quite often introduced normal to the lines of flow. Obviously in such cases when the velocity through the aperture of the sample is equal to that of the gas stream the sampling cannot be considered as isokinetic. Large particles will not be drawn into the probe and the errors introduced will depend on the size of the particles.

In the remarks above, reference has been made quite loosely to the terms "large" and "small" particles. For practical purposes, any particle two microns or less in diameter may be considered *small*. This statement is based upon the work of Watson,[4] who calculated the curves illustrated in Fig. 3 for spheres of unit density. These curves indicate that, under most sampling conditions, appreciable errors in concentration are not encountered when the particles are less than four microns in diameter.

True isokinetic sampling also requires laminar flow. When turbulent flow is encountered, the qualitative arguments described above are not necessarily applicable. General practice, however, has been to consider sampling as isokinetic whenever the forward velocity through the aperture of the nozzle is the same as the average forward velocity of the gas in the pipe. In most situations the flow in gas distribution and transmission systems is highly turbulent. Although in theory laminar flow conditions are necessary, there is evidence that a representative sample can be obtained even when the flow is turbulent.[8] In either case, it is desirable to sample isokinetically. If conditions prohibit isokinetic sampling, then the approximate error can be calculated from Fig. 3, and the results corrected.

Effects of Bends in the Sampling Probe

When a particle in a flowing stream is swept around a tube, two forces are present that do not exist when the particle is moving in a straight section of pipe. These are due to (1) viscous drag by the medium in which the particle is moving, and (2) the centrifugal effects in negotiating the turn.

Fig. 4 illustrates the motion of a particle in the fluid stream. The dotted line is the path of the gas, assuming no pressure gradient due to the centrifugal action. The solid line represents the motion of the particle under the influence of the existing forces. Radial forces resulting from the centrifugation and drag exist only in the turn. However, the sideways motion of the particle in the stream continues after the particle has left the bend and is traveling in the straight section of pipe.

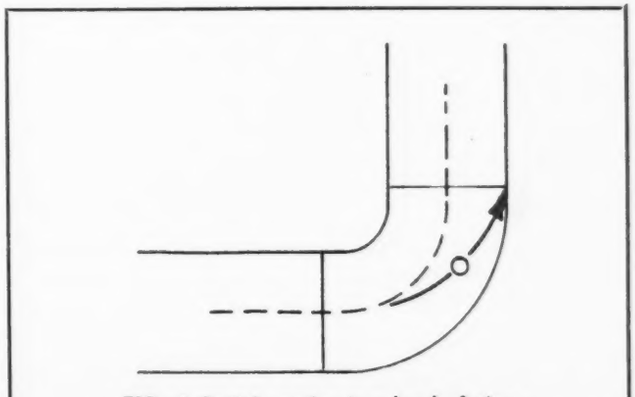

FIG. 4. Particle motion in a bend of pipe.

The lateral motion of a particle at a turn in the stream is a source of error in sampling probes that have bends, since impaction of the particles on the wall of the probe can occur with a consequent loss of particles. It is desirable to know the extent of such losses. A precise solution of the problem would be long, requiring the use of high speed computers. The problem is greatly simplified by considering the bend to be one-fourth of a revolution of a centrifugal separator. Equations of motion of a particle in a centrifugal separator have been worked out[5] and using these expressions[8]

$$D_p = \left\{ 9\mu \frac{ED}{V(\rho - \rho_o)} \right\}^{1/2}, E = \frac{V(\rho - \rho_o) D^2_p}{9\mu D} \quad . \quad . \quad (1)$$

Where **E** is the fraction of the particles of diameter $\mathbf{D_p}$ that will impact against the wall of the bend if the gas is moving with a velocity **V** in a pipe whose diameter is **D.** μ is the viscosity of the fluid ρ and ρ_o are the densities of the particle and fluid respectively.

A similar expression may be obtained by assuming that the particles reach the wall by a simple impaction phenomenon.[8]

Equation 1 is only a reasonable semi-quantitative description of what occurs at a turn in the pipe, since it does not consider turbulent effects. On the basis of this expression, however, it is possible to draw a number of interesting and important conclusions concerning sampling errors at bends in probes. These are:

1. **As the velocity in the probe increases a greater fraction of the particles will impact against the walls.**

2. **Impaction will be greater for larger and more dense particles.**

3. **The fraction of particles reaching the walls of the probe will decrease with increasing probe diameter and with increasing gas viscosity and density.**

If it is assumed that all the particles that impact against the walls of the probe will adhere to the wall, then **E** in Equation 1 is the fraction of particles of diameter D_p that are lost at a bend. Under certain conditions this fraction may be considerable. This is illustrated in Fig. 5, where curves are presented for the fraction of the particles that will impact against the wall of a probe as *a function of particle diameter, probe diameter, and gas velocity in the probe.*

Here it may be seen that very appreciable losses may be expected for particles with diameters greater than two to four microns under conditions that are prevalent in most sampling situations.

Actually, the situation depicted in Fig. 5 is probably overpessimistic, since it assumes that all particles that impact on the wall adhere to it. This certainly will not be the situation for a dry dust, as many of the particles will be reentrained in the gas stream. The situation, nevertheless, is quite serious and in model experiments appreciable losses due to this phenomenon have been demonstrated.[8]

Where more than one bend is present losses will occur at each bend. The total loss (E_T) may be obtained from the following expression:

$$E_T = 1 - (1 - E)^n \quad . \quad . \quad . \quad . \quad . \quad (2)$$

where **E** is the fraction lost at each bend and **n** is the number of bends. Thus the losses increase exponentially with the number of bends.

The seriousness of this situation can be illustrated by a simple example. Consider a 1.0 in. probe with a sampling velocity of 20 mph and 3 bends. For 5 micron particles, Equation 1 or Fig. 5 indicates that E = 0.22 or 22 percent of the suspended particles will be lost at each bend. From Equation 2, E_T = 0.53, or 53 percent of the 5 micron particles will impact against the wall. The losses will be even greater for the larger particles.

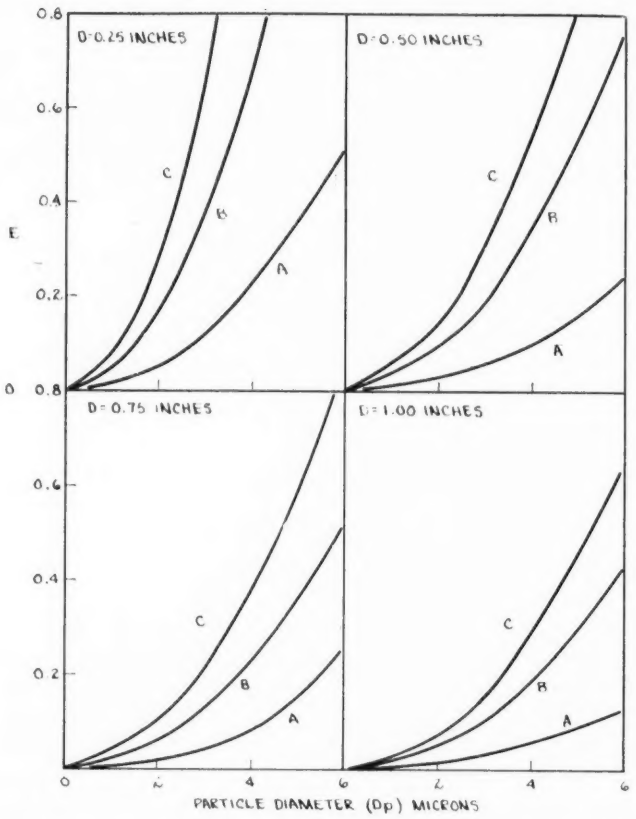

FIG. 5. Fraction of particles impacting at a single 90 deg bend in various size probes and at various gas velocities. Charts are calculated for spherical particles of density 2 in methane at 14.7 psig.

Losses Due to Diffusion of Particles to the Probe Wall

Diffusion of particles to the probe wall could be caused by several mechanisms; Brownian motion, turbulence, electrostatic forces, and temperature gradients. Each of the phenomena can produce a velocity component normal to the pipewall. Some of the particles which are driven to the wall by these effects will remain there and cause a sampling error.

Brownian motion, caused by molecular bombardment, is an effect of very low order.

Average displacements for particles of various diameter in air and in methane are shown in Table 1. The displacements are all very small compared with the dimensions of the sampling probe, so that losses by this mechanism will be negligible.

TABLE 1
Particle Displacement Due To Brownian Motion

Particle Diameter (microns)	in One Second (microns) In Air at 70 F, 1 atm	In Methane 70 F, 1 atm
0.1	29.4	38.0
0.25	14.2	18.0
0.5	8.92	12.0
1.0	5.91	8.0
2.5	3.58	4.6
5.0	2.49	3.2
10.0	1.75	2.3

The effects of **turbulence** on diffusion to the wall are difficult to evaluate quantitatively. In turbulent flow the particles are moving with an average velocity in the direction of probe axis, but have varying velocity components in the direction of the wall. The particles near the wall may receive enough momentum to carry them through the stag-

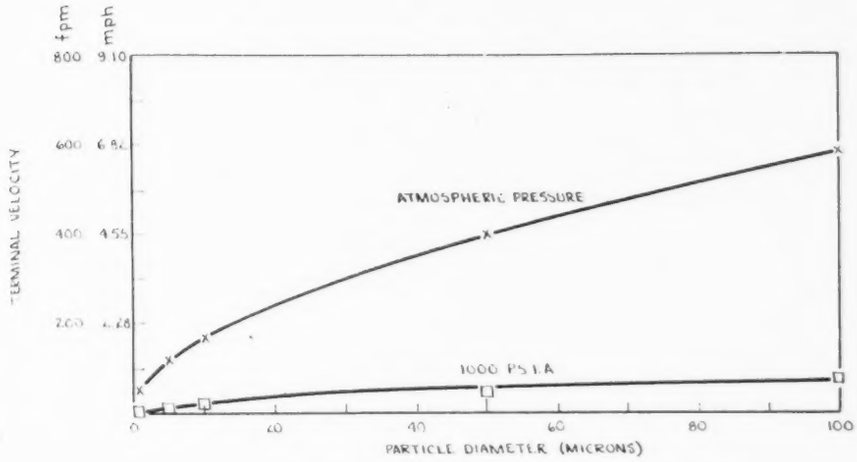

FIG. 6. Terminal velocity of various size particles in turbulent methane.

nant gas layer at the probe wall and adhere to the probe. Turbulence can also produce the opposite effect, and remove particles from the wall and return them to the main gas stream. If the particles are not tightly adhering to the wall, these opposing effects will tend to cancel, with the net result that a sampling error due to turbulence can be expected to be small.

Motion toward the wall caused by **temperature gradients** within the probe is an effect of very small magnitude. It seems doubtful that this phenomena will result in any appreciable errors in a normal sampling probe.

A major cause of sampling error by motion to the wall may arise from **electrostatic forces.** Most aerosols carry a net electrical charge. This charge provides a force on the particles in the presence of an electric field that will drive them toward the walls, and cause them to adhere very tightly.

Experiments on sampling have indicated that this last phenomenon may cause a sizable sampling error.[8] The effect can be eliminated by inserting a radioactive material near the probe nozzle. This will neutralize the electric charge on the particles and prevent any motion due to electrostatic attraction.

Losses Due to Gravitational Settling in Vertical Sections of Probe

The particles in a gas stream flowing in either a horizontal or vertical direction are subject to the earth's gravity. This will accelerate the particles in a downward direction. In a vertical section, the particles whose downward velocity is greater than the bulk upward velocity of the gas will fall through the rising gas stream and be lost. Therefore, the particles that will not be able to negotiate a vertical section in a probe are those that would settle through the gas with a velocity that is greater than the linear velocity of the gas. The settling velocity, or terminal velocity (V_T), of a particle in a turbulent gas is given by the expression:

$$V_t^2 = \frac{4gD_p}{3C} \frac{\rho - \rho_o}{\rho_o} \quad . \quad . \quad . \quad . \quad . \quad (3)$$

where **g** is the acceleration of gravity. The constant **C** is a function of the gas viscosity. For methane, C = 0.44. A graph of terminal velocities for particles of density, 2, is given in Fig. 6. Whenever this velocity is greater than that of the gas stream, the particles will not be carried up the sampling probe.

At 1000 psia, the terminal velocity of all particles with diameters less than 100 microns are less than 100 fpm (1.1 mph). This velocity is less than the probe velocities generally encountered in practice, so that errors due to vertical settling are practically nil. Even at atmospheric pressure the terminal velocity of 100μ particles is less than 600 fpm (6.8 mph). Since such small velocities are seldom encountered, errors due to this phenomenon are rare.

Effect of Gravitational Settling in Horizontal Sections

A fraction of the particles suspended in a turbulent flowing gas stream is constantly being lost by settling to the bottom of the pipe. At the same time, due to the turbulence in the pipe, a portion of the material that has collected on the pipe walls is constantly being re-entrained in the gas. The net effect is an apparent constant concentration of particles in the gas when the flow conditions are uniform with respect to time. When a portion of the flowing gas enters a sampling probe, the turbulence in the probe decreases, due to the smaller diameter of the probe.

As a matter of fact, with a ⅜-in. probe, if the flow is less than approximately 15 mph the flow will be laminar and there will be no turbulence. Because of the smaller diameter of the probe, the time for a particle to settle to the bottom of the probe is less than in the pipe. Also, because of the decreased turbulence within the probe, fewer, if any, particles will be re-entrained, having settled. The net effect is a loss of particles due to settling in the horizontal runs in a probe.

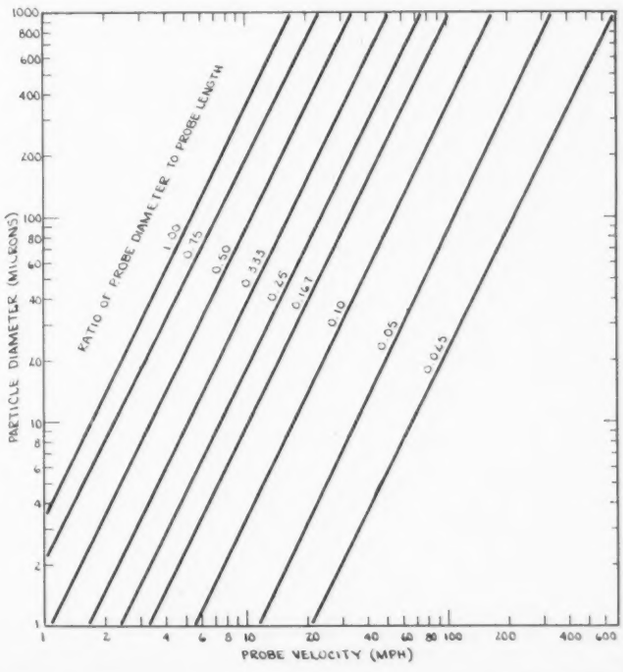

FIG. 7. Calculated particle diameter for 25 percent settling loss in horizontal probe.

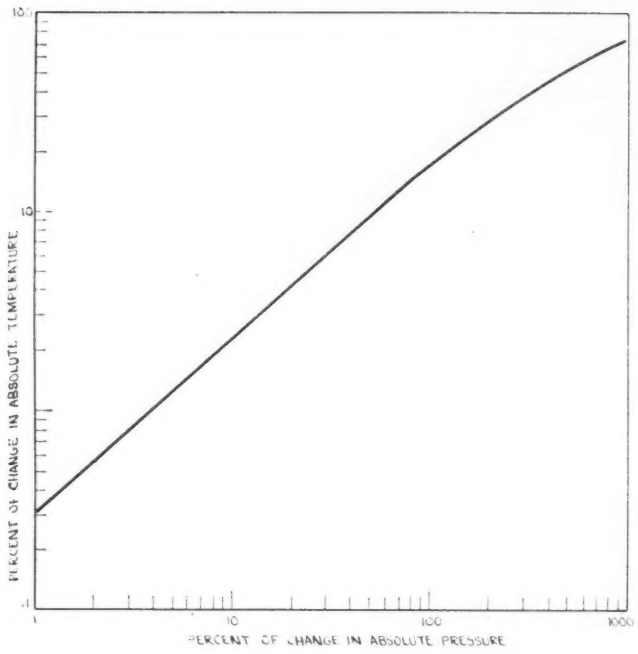

FIG. 8. Change in absolute temperature with a change in pressure for methane undergoing adiabatic expansion.

If the assumption that all particles reaching the wall are trapped and not re-entrained, the sampling loss is given by:

$$E = \exp\left[-\frac{2L}{VD}\left(\frac{4g\rho}{3C\rho_o}D_p\right)^{1/2}\right]. \quad . \quad . \quad (4)$$

where:

E = fractional loss in particles
V = sampling velocity
D = probe diameter
g = acceleration of gravity
ρ = density of particle
ρ_o = density of gas
C = constant (0.44 for methane)
L = horizontal length of the probe

Using this expression, curves corresponding to 25 percent particle loss were calculated and are illustrated in Fig. 7. Losses will be greater than 25 percent for particles larger than the indicated size and smaller for smaller particles.

The losses, in general, will be lower than predicted due to re-entrainment. For minimum loss, the probe should be as short as possible and as large in diameter as is practical. Under most conditions, velocities will be in the range of 10 to 50 mph. Consequently, in order to collect particles up to 10 microns with minimum loss the ratio of probe diameter to probe length should be greater than approximately 0.17. For a ½-in. probe this means that the horizontal run should be less than about 3 in.

Effect of Changing Temperature

Heating or cooling a sample line that contains vaporizable or condensable components would be expected to change the concentration of these materials as suspended particles. On the other hand, when the suspended material is a solid and there are no condensable or vaporizable components in the gas stream, heating or cooling does not effect the number or size of the particles.[8]

When a gas is expanded or compressed adiabatically, the temperature of the gas is related to the pressure of the gas by the expression:

$$\frac{T_B}{T_A} = \left[\frac{P_B}{P_A}\right]^{\frac{k-1}{k}} . \quad . \quad . \quad . \quad . \quad (5)$$

where **A** and **B** refer to the initial and final states, **T** is the absolute temperature, **P** is the pressure, and **k** is the ratio of heat capacities $\frac{C_P}{C_V}$. For methane, k is equal to 1.3.

Fig. 8 gives the percentage change in the absolute temperature for various percentage changes in the pressure. It may be seen that small changes in pressure can result in very appreciable changes in temperature; for example, if methane at 25 C were subjected to an expansion that changed the pressure by 10 percent, the absolute temperature would change by 2.3 percent, or 6.9 C.

The change in the concentration of liquid suspensoids when compressing or expanding the gas in the sampling line can be determined. These errors can be very large for liquid particles. For example, a temperature change of 5 C in a gas saturated with pentane at 25 C could condense 15 tons of pentane per million cubic feet. Errors of this nature can be eliminated only by proper design of the probe (uniform cross section throughout), and by rigorously maintaining the gas at constant temperature.

Effect of Sampling Nozzle Diameter

Earlier, the necessity for isokinetic sampling in order to obtain a representative sample was discussed. Even at isokinetic conditions, errors may be introduced if the probe diameter is smaller than a critical size.

The effect of probe diameter on particle concentration is shown graphically in Fig. 9. Here it is seen that below about 0.6-in. the sample concentration drops very rapidly.

Other investigators have found that probes of diameters 0.25 to 0.40-in. could be used without introducing serious errors.[3,4,7] The explanation for the errors is based on the effect of the bluffness of the probe, i.e., the ratio of probe wall area to probe aperture area. Use of a feathered or streamlined nozzle will tend to eliminate this type of error.

Part 3-B, which will appear next month, will discuss "Recommendations for Sampling."

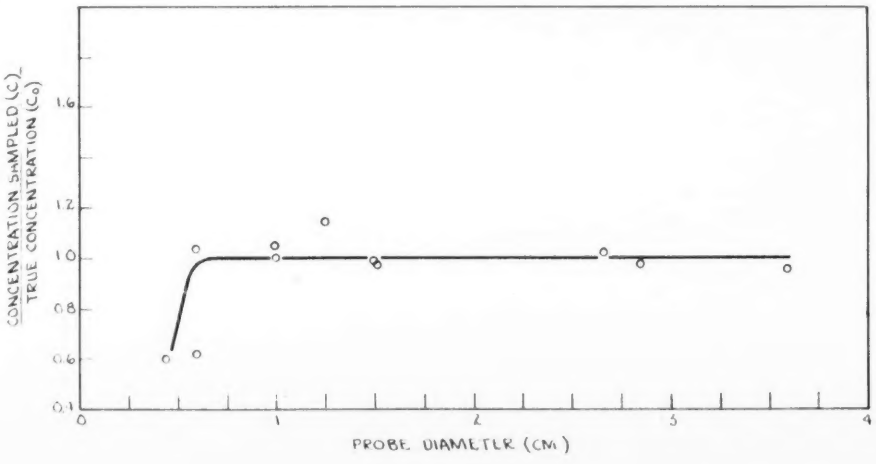

FIG. 9. Effect of probe diameter on sample concentration based on data of H. H. Watson.

Word Magic . . . can work wonders in helping to "get things done"

Jack E. Bedford, *Professor of Management, Armstrong College*

TO GET THINGS DONE in a gas company requires some means of communication. It may be a notice on the bulletin board, an announcement over the public address system, a written report, or a personal conversation.

However the message is delivered, it must be done with words. How successful we are in getting people to do the things we want done depends on our choice of words . . . **word magic.**

Here are some words and phrases you may find helpful in building better employee communications . . . **word magic** that will get things done for you:

When

Positive thoughts are expressed in positive words—and, positive thoughts get things done.

Consider, for instance, these two requests:

"If you get time, do this . . ."

"When you get time, do this . . ."

Except for the change of one word, these two requests are exactly the same. But, the change of one word changes it from a negative to a positive request.

IF is a weak, wavering, vacilating word. It makes it easy for the employee to procrastinate. Things are put off rather than done.

WHEN, on the other hand, is a strong, stimulating positive word. It gets things done quickly and with a minimum of friction.

Yet, because the request is prefaced by "when," it is not a command that will arouse resentment of the employee. Instead it gives the employee a choice of *when* he will perform the task, not *if* he will do it.

To apply word magic in your employee relations, you need to do two things:

1. Think positive thoughts about getting the work done.
2. Preface your work request with *when* instead of *if*.

Another way you can use word magic is by asking a question. For instance, you might want an employee to do something as soon as possible. You would ask:

"When can you do this—today or tomorrow?"

This assumes the employee will perform the task. It has the positive approach. And, it gives the employee a feeling of importance because he can make a decision of doing the work today or tomorrow.

As this question is phrased, there is a good chance the task won't be done tomorrow. But, if there is an urgency about getting it done today, change the order of the choice in your question. For instance,

"When can you do this–tomorrow or today?"

You place emphasis on the time you want the work done by placing it as the second choice. This is the last thing the employee hears and chances are he will give you the answer you want:

"Today."

Other choice words you can use in addition to *when* include — *which, what, where* and *how*. Any of these words will key your questions to give the employee a choice between two things.

Another thought to keep in mind about using this word magic in question form is to make the choice between something and something . . . not between something and nothing.

Asking the employee when he can do the work leaves the answer wide open to time. But, when the choice is nailed down to today or tomorrow, he will answer with one of those choices.

For Example

One of the most important parts of a gas company executive's management functions is training employees. This on-the-job training takes on added emphasis when you employ word magic in your instructions.

FOR EXAMPLE is basic word magic in training. We use it all the time. We all learn through illustrations of the right and the wrong way to do things. And, since we are so conscious of this learning method, we are alert for examples that will help us understand better.

When you preface instructions with the words, **For example,** you snap the employee to attention for your illustration. He is eager to learn how it is done, and listens to your example.

In using this word magic, you need to consider a few rules.

FIRST, **the example you use should be given to prove your point.** Make your point and follow it up with the word magic, **For example.**

SECOND, **make your example be specific.** You will make it more interesting and more memorable to the employee you are training when you use specific terms.

THIRD, **your example should be relevant to the point you are presenting.**

FOURTH, **add some variety.** Use these phrases to spice up your instructions—

(Continued on page 36)

The Telephone as a Collection Tool

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AS A COLLECTION TOOL, the telephone is not a cure-all. From the standpoint of public relations and cost, however, it offers distinct advantages. It can become an important part of a properly planned program of collecting delinquent accounts—in conjunction with mail requests and personal contacts. This discussion endeavors to relate the use of Mr. Bell's little black box to the fundamental problems of collection—including public relations, techniques, and costs.

Collections and Public Relations

Collection of delinquent accounts is not always conducive to the best in utility public relations. Repeated efforts of collection departments to obtain money from a customer for services rendered may ultimately deprive a company of that customer's goodwill or change a passive attitude to one of active ill will.

Many companies feel they cannot afford the loss of goodwill from any customer — and must be ceaseless in their efforts to improve the climate of public contacts. But, there also comes a time when even the most prudent policy of collection and public relations leaves nothing to be done except discontinue service.

If efforts preceding such action have been considerate and with the least embarrassment to the customer, the possibility of retaining goodwill has been greatly enhanced.

Of all forms of collection contacts, the one liked least by customers is a personal call at their premises, which is likely to be open to public view. Repeated calls may result in payment, but at the expense of awareness by friends, neighbors, and relatives, and consequent embarrassment.

This, of course, does not apply to the chronic delinquent, who welcomes the field collector; these individuals are not considered here.

The field collector, however, should be a last resort, to be used only after repeated mailings of requests for payments and other contacts — such as use of the telephone—have been made.

Fortunately, many delinquent accounts can be contacted, and motivated to pay, simply by calling them on the telephone.

Telephone Is Good Approach

The telephone has numerous advantages over other forms of collection procedure. Its greatest asset is the public relations aspect of personal contact in a private manner. Among the many advantages are these:

- customer greatly prefers a telephone contact to a personal contact at his premises.
- there is no implied threat of immediate discontinuance of service.
- customer is more inclined to discuss his ability to pay and to cooperate with suggestions for payment.
- frequently, misunderstandings regarding billing direction, due date, rates, and/or other circumstances, which have delayed payment, can be settled at once or by call-back.
- when customer discloses extenuating circumstances, company has opportunity to demonstrate willingness to cooperate.
- telephone contact can be flexible, with appeal adapted to the individual or to circumstances.
- cost of a telephone call is many times less than cost of a field call.
- use of telephone results in collection of many accounts that would probably be disconnected if referred to field collector.

Survey Shows Results Are Good

In a survey of member utilities of the Wisconsin Utilities Association, inquiries were made with regard to extent, application, and effectiveness of the use of the telephone in collection work. Replies indicated usage of the telephone ranged from a full integrated program to use only in specific cases of delinquency. A summary of replies included these comments:

Experienced male employees are predominantly used in telephone collection work, spending from one to five hours daily in this effort.

None of the reporting companies has found it necessary to hire part time employees for this work.

Training of employees in telephone collection techniques is done by credit and collection managers or supervisors, sometimes with the assistance of telephone company personnel; however, several companies have no formal training program.

Telephone calls are made on current service accounts, off-service accounts, and merchandise accounts.

On current accounts, most companies make the telephone call after mailing the reminder notice, and the clerk has the history record with him when telephoning.

In most companies, the telephone clerk is prepared to take high bill complaints, service requests, and requests for account investigation.

Most companies have their personnel telephone in the morning or afternoon, two telephone in the evening, and two on Saturdays.

As many as four attempts are made daily to contact the customer who does not answer.

Most companies follow up a promise to pay. If not paid as agreed, most will send a collector, although some will telephone again, or send a letter.

If a telephone contact cannot be made, all companies then send a collector.

Most utilities are using the telephone with the intent of replacing the field call.

(Continued on Page 36)

New

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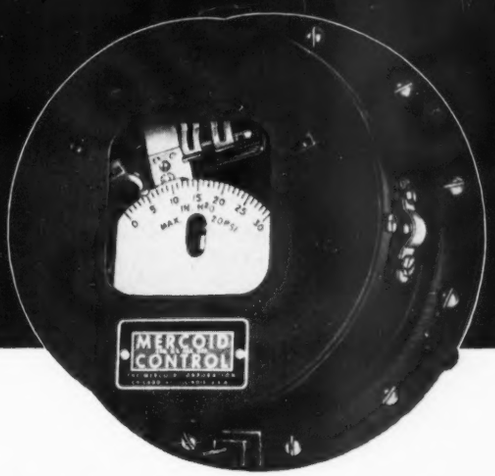
LOW PRESSURE DIAPHRAGM CONTROL

FOR GASES OR AIR

PRESSURE — VACUUM — DIFFERENTIAL PRESSURE



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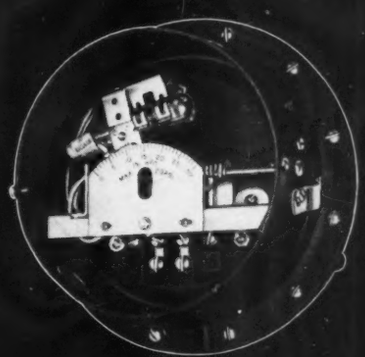

CAN BE USED THREE DIFFERENT WAYS

For operation as a

POSITIVE PRESSURE CONTROL
NEGATIVE PRESSURE (VACUUM) CONTROL

DIFFERENTIAL PRESSURE
(POSITIVE OR NEGATIVE PRESSURES)

This control employs a diaphragm which actuates a mechanism for opening or closing a mercury switch. The diaphragm separates two pressure chambers, one of which may be used for positive pressure; the other for negative (vacuum) operation or both chambers may be used to provide operation due to a difference in pressures between them.

OPERATING RANGE: 1.0" to 30.0" (H_2O)
MAXIMUM PRESSURE: 20 Psig

FIXED DIFFERENTIAL (SENSITIVITY)
When operating point is set at

LOW	MEDIUM	HIGH
0.6"	0.8"	1.0"

TYPES AVAILABLE

FULLY AUTOMATIC OPERATION: sp-st circuit opens on increase of pressure, vacuum or differential pressure; or sp-st circuit to open on decrease, (Available sp-dt or dp-st.)

SEMI-AUTOMATIC OPERATION (With Manual Reset): Available to operate automatically on decrease or increase.

FOR FURTHER DETAILS WRITE FOR BULLETIN PG

THE MERCOID CORPORATION
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(Continued from page 33)

as a case in point, to illustrate, and *for instance.*

FIFTH, **be alert to examples you can use to point up your instructions.** By collecting examples of both the right and the wrong way of doing something, you will make your instructions more interesting to the employee.

Yes, But

Communications between management and employees can bog down when an argument develops. Everyone has opinions on different subjects, and some employees are prone to express their views in no uncertain terms. When there is a conflict of viewpoints, an argument is the natural result.

Good employee relations has a basic principle that is well known to all supervisors—**Don't argue!** Yet, there are times when it is important to change an employee's ideas and opinions to make the work move smoothly and to get things done.

The **Yes, but** word magic can do this for you. When an employee raises some objection to doing something or accepting some rule, you employ the **yes, but** word magic. Here is a three-step plan to follow in using this word magic:

FIRST, **you agree with the employee.** You say *yes* to his thoughts and ideas. This softens the blow of your counter argument and makes the employee more receptive to your side of the issue.

SECOND, **cushion the argument.** This is merely an expansion of the *yes* idea. You agree and you continue with this agreement to get out of the argumentative frame of mind. You might say: *"Yes, I know how you feel about that. I had the same idea for a long time. In fact, I was sure it wouldn't work. But, ..."*

THIRD, **present the other side of the argument with a but preface.** You will find that this *yes, but* word magic will keep you from starting an argument, and will help open the employee's mind.

Why not try this word magic in the next employee relations problem that develops?

First, you ask the employee **when** he can do the assigned task. If possible, you give him a choice of **when** he will do it.

Second, you give him an **example** of how the work should be done, making your illustration crystal clear so there is no misunderstanding.

Third, if an argument develops, handle it with kid gloves by employing the **yes, but** word magic. This will change the argument into a friendly discussion.

Yes, word magic will help you get things done! * * *

(Continued from page 34)

TABLE 1
Cost Summary of Milwaukee Gas Telephone Experiment.

Contact Results		
Telephone contacts made	1208	52%
Telephone calls not answered	480	20%
No telephone available	653	28%
	2341	100%

Collection Results (1208 accounts)	Number of Accounts		Amount	
Payments received	916	76%	$11,818.32	63%
Payments not received	292	24%	6,970.31	37%
	1208	100%		100%

Average Bill	
Per contact call	$15.55
Per collection	12.90
Labor Cost	
Obtain telephone numbers and history cards	$ 52.96
Telephone work	157.94
Total	$210.90
Average Cost per Productive Contact	
Telephone experiment (916 accounts)	$ .229
Average cost per productive call—field collector—year 1956	1.76

Classification of Customer Reaction to Telephone Contact		
Remittance mailed recently	255	21%
Will pay in full	521	43%
Will pay in part	100	8%
Will phone company	274	23%
No promise	58	5%
Total	1208	100%

Most companies are selective as to areas in which telephone contacts are scheduled in order to minimize travel time of field collectors.

All utilities reported favorable customer reaction to the telephone request for payment.

The average percentage of the number of accounts contacted by telephone, on which collection of all or part of the bill is made, varies from 10 to 90 percent.

Records of the number of collection telephone calls and the cost per call is not available from most companies. Two utilities reported that their clerks made 20 calls per hour; one reported cost at 10 cents per call and another at about 23 cents per productive contact.

Milwaukee Experiment Results

While the telephone has always been used to a considerable degree in Milwaukee Gas Light Company's collection work, it has been primarily directed toward collection of off-service accounts. Only occasional telephone contact has been made on current account delinquencies, principally commercial accounts and serious delinquencies on domestic and spaceheating accounts.

Recently, an experiment was conducted over a six-weeks period. Prior to the experiment, the number of current accounts past due notices increased to an extent that it was impossible to schedule a collector's call on each delinquent account.

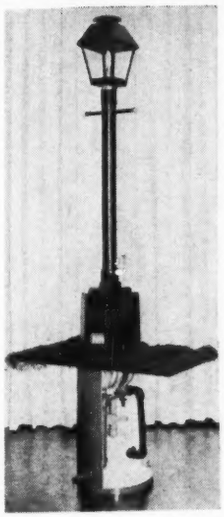
Two collection department clerks were assigned to telephone these customers; one typist was assigned to obtain telephone numbers from a criss-cross directory and select history records on the accounts. Calls were made during regular working hours; none were made on Saturday. In order to determine labor costs, exact records were kept of time devoted to this work.

For purposes of comparative cost of field collection, the number of collections by collectors was added to the number of collection disconnects to obtain a figure called "productive calls." (Notices left by field collectors may result in payment but statistics on such payments are not available; for truly comparative purposes, the "productive call" cost of field collection undoubtedly is somewhat high.)

A summary of results of the experiment is shown in Table 1.

Results of the experiment clearly indicated the value of telephone contacts in collection work. It must be remembered, however, that these figures and percentages were obtained from accounts that represented overflow work normally scheduled for a collector's call, and, as such, represented less serious collection cases.

Possibly, if the telephone collection efforts had been directed to customers with larger delinquencies, results of the report might have been less satisfactory. It is important to point out that the cost figures cover only those costs incurred after the time a decision was made to either telephone or send a field collector. * * *



New Spot for Gas Meter and Regulator, mostly underground, is in water-tight housing at base of gas light. Window at base of light allows meter dial to be read. Meter in gas light base was first installed in Rochester, New York. Light will be installed after house is completed.

Meter-Gas Light Combination Makes Attractive Installation

INGENUITY HAS TRIUMPHED again in the amazing gas distribution industry! Latest achievement is a two-birds-with one stone installation plan that places a residential gas meter at the base of an exterior gas light post. The unique combination has been developed by Rochester Gas and Electric Corporation.

Developed by engineers under the direction of Fred Pfluke, general superintendent of RG&E's gas division, the arrangement permits meter reading without entering the home, and without depending on such alternatives as exposed meters on the outside of the dwelling or a window to permit the reader to see the meter inside the building. Instead, a small, inconspicuous window at the base of the light permits reading the meter dial.

Test installation of the new combination has been made in front of a house under construction in Rochester, with the post-mounted gas light to be added when the dwelling is completed. Use of the combination set up could make possible routing gas supply lines through back yards to permit the meter-gas light in back yards and also have a readily available fuel supply for other gas appliances to be used outdoors. The latter uses include a number of gas-fired barbecue grills now available. Additionally, a gas industry committee is considering installation standards for gas incinerators outdoors.

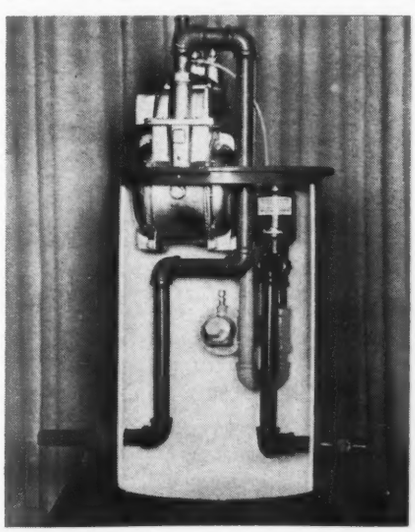
Inexpensive installation techniques utilizing copper tubing have been developed for gas lights and grills located outdoors and connected to the gas supply in the dwelling. Arrangements such as the one developed by RG&E are seen as making it still easier for gas utility customers to use the fuel outdoors.

The proposed combination of gas light and meter-regulator is subject to a number of variations. Basically it involves an underground watertight housing with a gasketed plate on top to which the meter base is attached. The base can be easily raised and the meter changed without disturbing the light.

One proposed arrangement at RG&E includes a shutoff valve and a primary regulator to cut the inlet pressure from 50 psi to approximately 5 psi. The meter incorporates a regulator that reduces the pressure from 5 psi to utilization pressure of approximately 6-in. w.c.

Connection to the gas light comes off a reducing tee at the top of the meter; it would be a simple matter to provide connections for other outdoor appliances. * * *

Inside View shows how meter and other equipment fits into base of gas light. Connection to gas light is off reducing tee shown at top of meter.



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W-300	Rated cap. 300cfh — FOB Philadelphia
W-45-LPG	Rated cap. 45cfh* — FOB Philadelphia
WC-45-LPG	Rated cap. 45cfh* — FOB Philadelphia

*propane

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Free Piston Engine Compressor

THE FREE PISTON engine compressor consists of a single free piston unit that absorbs the energy of gas combustion on one end and compresses refrigerant vapor on the other end. A free piston engine differs from the conventional internal combustion engine (as used in automobiles) in that it has no rotating crankshaft and therefore offers greater simplicity.

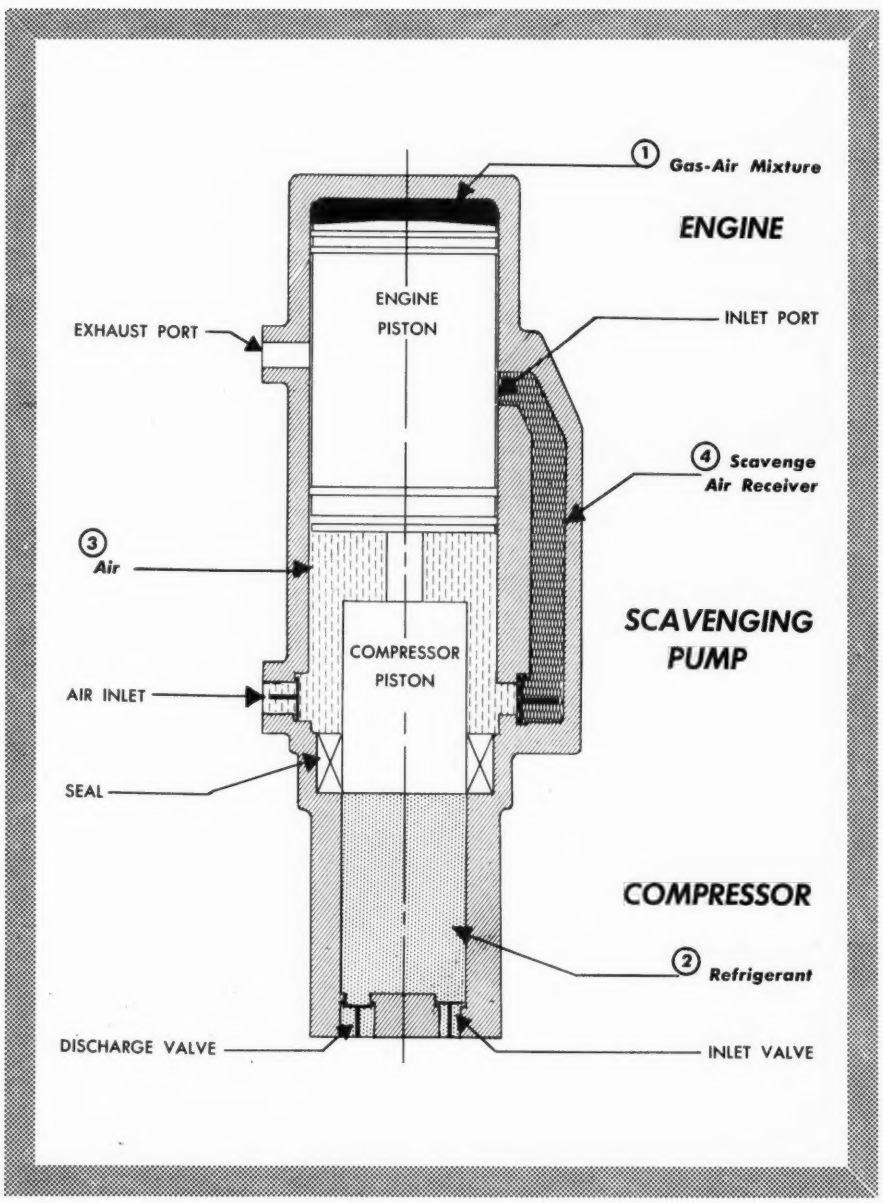
Its operation is as follows:

At the **piston's** topmost position, the **gas and air mixture** is compressed in the **combustion chamber** (1) and a charge of refrigerant is present in the **compressor chamber** (2). The gas-air mixture is ignited by a suitable means and the resulting combustion forces the piston downward in the **cylinder,** compressing the refrigerant in the compressor chamber and forcing it out the **discharge valve.**

The downward motion of the piston also forces the air in the **scavenging pump chamber** (3) into the **scavenge air receiver** (4). As the piston moves downward, it opens first the **exhaust port,** releasing the exhaust gases, and then the **inlet port,** through which the air compressed in the scavenge air receiver enters the combustion chamber and scavenges the products of combustion.

As the piston reaches its bottommost position, the refrigerant pressure acting on the bottom of the compressor piston forces it back upward in the cylinder. As the piston moves upward, air is drawn into the scavenging pump chamber through the air inlet. Gas is then injected into the combustion chamber and the gas-air mixture is compressed again. The cycle then repeats itself.

Such a free piston combination acts as both the prime mover or driving unit and the compressor unit for use in the conventional vapor-compression refrigeration cycle. Thus, it is comparable to and can perform the same function as an electric motor and reciprocating compressor used in electric vapor-compression air conditioning units and kitchen refrigerators. * * *



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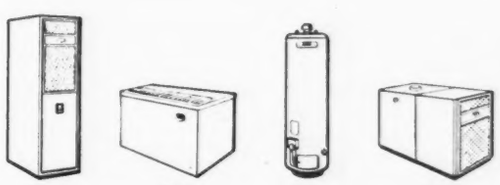

389 Gas Furnace | 562 Air Conditioner | 148 Water Heater | 273 Oil-Fired Boiler

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DATA SHEET:

Types of Corrosion

Galvanic Corrosion

Practically all corrosion encountered in pipeline operations is galvanic in nature, wherein the chemical change is accompanied by a transfer of electrical energy. Such reactions are called *electrochemical*. In galvanic corrosion, the area from which current flows is called the **anode**; the area to which the current flows is called the **cathode**. Two types of galvanic corrosion exist — one in which dissimilar metals are in a common electrolyte, and one in which a common metal is in dissimilar electrolytes.

Dissimilar Metals. One of the most prevalent and least considered galvanic cells occurs when a piece of new pipe is placed in an old line, as in Fig. 1. The new pipe always becomes the anode and its rate of corrosion depends largely upon the type of soil and relative areas of the anode and cathode. If a very short piece of pipe is installed, the corrosion rate is usually very accelerated because the small anode area must supply current to satisfy a much larger cathode area of the old line.

Fig. 2 illustrates another common type of galvanic cell, one that is produced by differences in the surface condition of the pipe metal. Scars or scratches on the pipe surface become active anode areas soon after a line is buried. The same is true of bright surfaces of the shallow threads adjacent to a coupling or fitting. In both cases, the bright surface becomes the anode and the rest of the pipe surface is cathodic. In some soils, such corrosion cells are very active and destructive, due to the ratio of the small anodic area to a large cathodic area.

Fig. 3 shows another common type of galvanic cell occuring on the surface of new pipe. Mill scale, imbedded on the pipe surface during manufacture, acts as a dissimilar metal from the pipe wall. Current in the cell will flow from the pipe (the anode) through the soil to the mill scale and return to the pipe metal. Pits form at the anodic area.

Dissimilar Electrolytes. Galvanic corrosion of this type along pipelines is generally due to differences in soils or soil conditions. Fig. 4 illustrates a condition at a location having two completely different soil types. While the pipe is of common metal, the two different soils produce the effect of a dissimilar electrolyte, causing the pipe in the anode area to corrode while pipe in the cathodic area is protected. If the resistance to current flow through the soil from the anode to the cathode is high, the corrosion rate will be slow. Conversely, if the soil resistance is low, the corrosion rate will be rapid.

Fig. 5 shows another type of galvanic cell produced by a mixture of different soils. If large clods of dirt (usually resulting from hand digging) rest against the pipe, the area that they touch tends to become the anode of a galvanic cell. Such cells, having their anodic and cathodic areas around the circumference of the pipe, are called short path cells, and produce very rapid pitting. Machine ditching usually produces a well mixed spoil bank, resulting in a great number of small cells that tend to neutralize each other, resulting in a slow corrosion rate.

Fig. 6 shows another cell in which the soil throughout the depth of the ditch is uniform in type or kind, but the pipe rests on heavy, moist, undisturbed ground at the ditch bottom, while the pipe circumference is in contact with drier backfill. Greatest dissimilarity — and most dangerous condition — occurs along the bottom of the pipe. It can produce very severe pitting.

Stray Current Corrosion

Stray current corrosion can occur any time a pipeline is laid in the vicinity of an electrified railway, electrified manufacturing plant, or near structures that are being protected by an impressed direct current. In such cases, the ground (earth) is often used as a return path for the current. Often, however, the current strays from its direct path via some other structure — such as a pipeline. Because such currents "stray" from their desired paths, they are called "stray currents." At points where such currents flow onto the pipeline, the pipe is the cathode of a cell and is protected. Likewise, where the current leaves the pipeline, the pipe becomes the anode of the cell and will corrode.

Bacteriological Corrosion

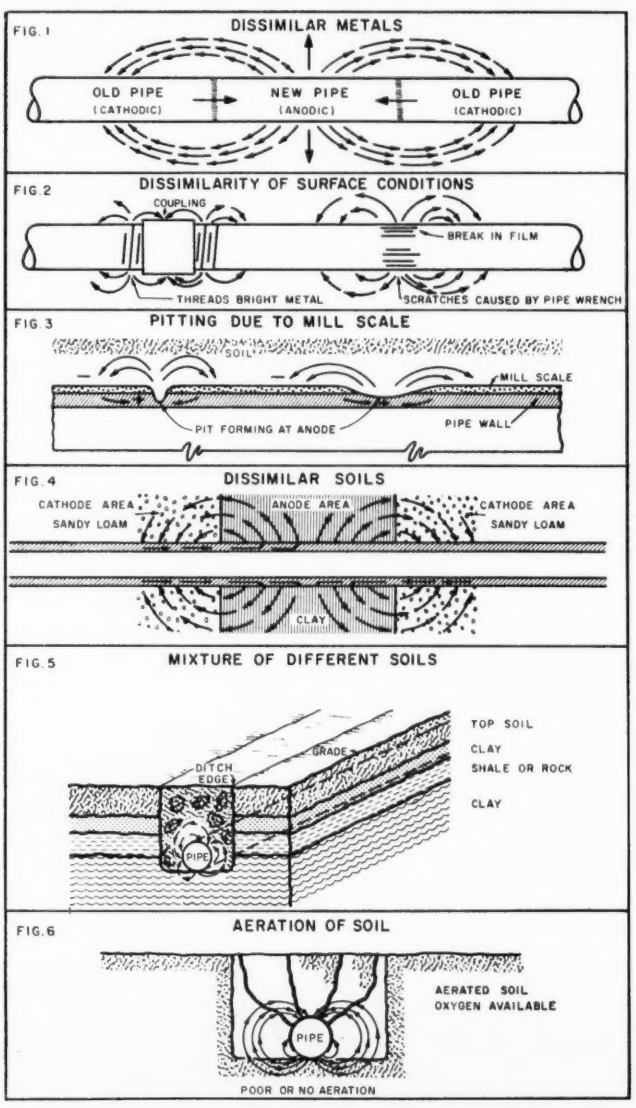
Bacterial corrosion — or more specifically, anaerobic bacterial corrosion — is often not recognized. The modern concept of such corrosion is that bacteria found in soils cause changes in the physical and chemical properties of the soils. By so doing, they produce either active galvanic cells due to differential aeration or destroy the protective hydrogen ion films that normally collect along the cathodic surface of a galvanic cell (which reduces its activity). Such corrosion takes place only under certain conditions where no free oxygen is present and results in production of sulfide as a corrosion product. It is affected by such factors as soil moisture content; whether soil is neutral or acid; abundance and type of organic matter (leaves, roots, wood type fibers), and presence of necessary chemical salts required as food for the bacteria. Additionally, the soil temperature around the pipe must be used as to permit the bacteria to grow.

Other Types

Direct Chemical Attack. While electrochemical in nature, no current flow is detectable in this type and there are no definite anodic or chemical areas. It is often the result of secondary reactions involving corrosion products or due to mechanical removal of protective films by erosion, thermal changes, or flexure of metal under load.

Dry Oxidation. This type occurs when clean surfaces of metals are exposed to air or other gases, forming oxide films and other compounds. Rate of film growth is usually greater at higher temperatures. Moisture in air or gases can accelerate rate of attack.

Atmospheric. This is a combination of electrochemical attack and direct chemical attack. It is influenced by temperature changes, alternate wetting and drying, and the washing action of elements that modify rates of film removal. A noted difference can be observed between rates of attack in industrial atmospheres and rural atmospheres.



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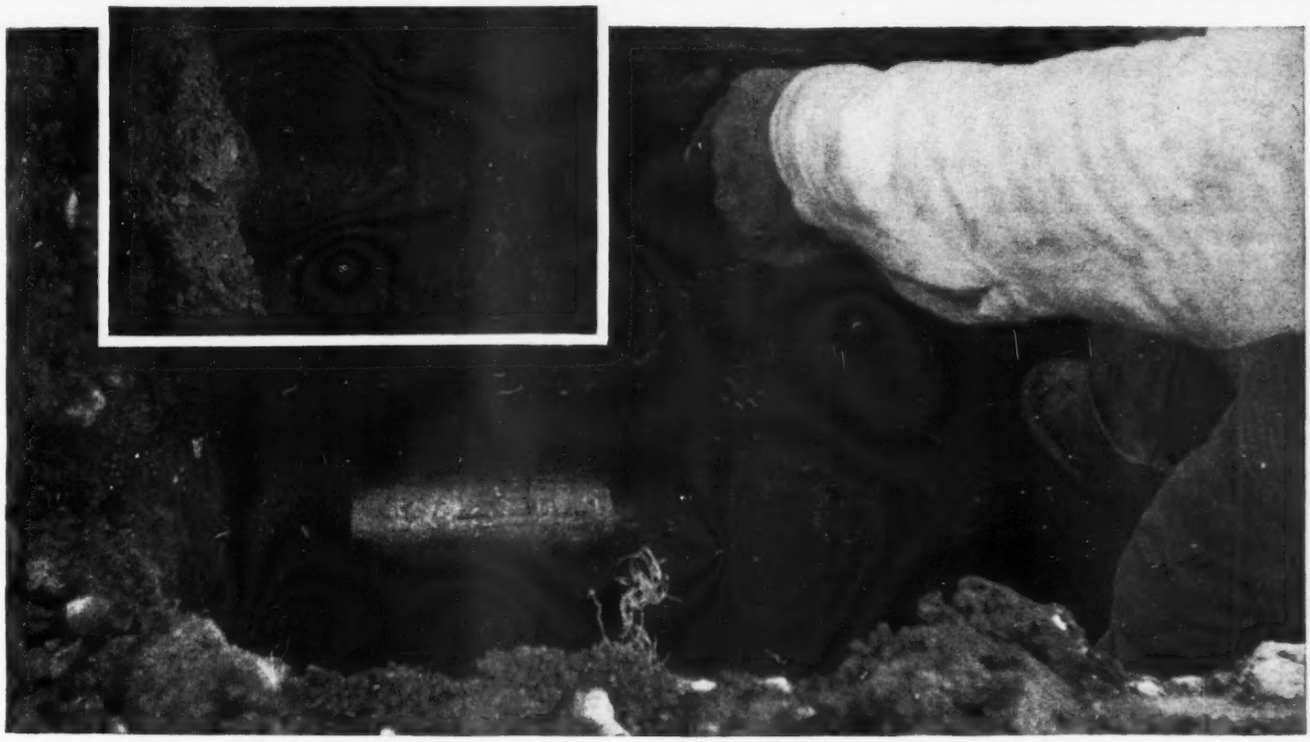

Year After Year...More Evidence Proving That TAPECOAT® Adds Years of Service Life to Gas Lines Underground or Under Water

Right across the country, TAPECOAT installations prove that you get more for your money when you measure pipe protection with a calendar.

Since this cost-cutting coal tar coating in tape form was first introduced in 1941, it has demonstrated its ability to withstand severe conditions underground or under water. TAPECOATED lines dug up after 17 years of service show no signs of deterioration on the pipe.

Typical is the experience of a utility in a coastal area. For a thorough trial, this company applied TAPECOAT in areas where severe corrosive conditions were known to exist. The lines were dug up this year and, after years of service under severe conditions such as brackish waters and corrosive soil, the pipe showed no signs of corrosion, proving the quality of TAPECOAT protection.

In terms of preventive maintenance and replacement costs, performances like this emphasize the most important consideration in buying protection. Remember, TAPECOAT is a hot-applied coal tar coating in tape form—designed for lasting protection on pipe, pipe joints, service connections, mechanical couplings, fittings, insulated lines, tanks, tie rods, and other steel surfaces vulnerable to corrosion.

TAPECOAT comes in rolls of various widths and is available in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

A TAPECOAT sales and service engineer is always available to help you on any corrosion problem. Write for complete details today!

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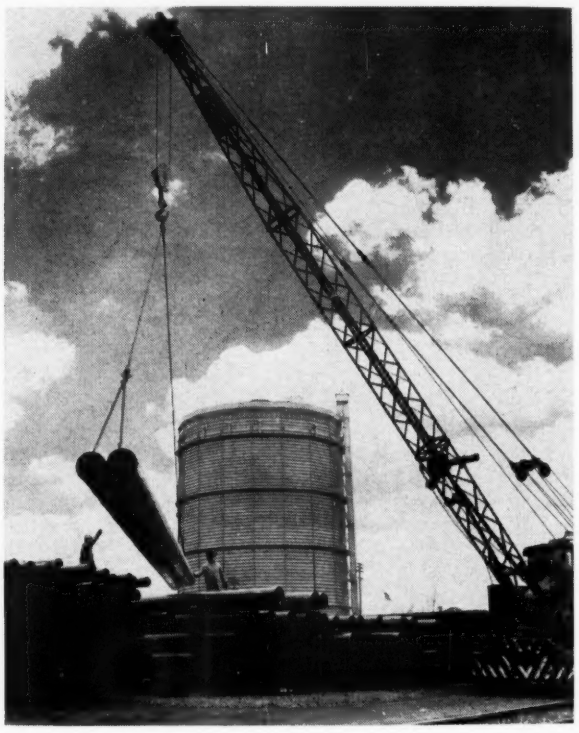
NEWS ABOUT CURRENT AND PLANNED CONSTRUCTION

Washington Gas Light Company, Washington, D. C., plans to spend approximately $15,500,000 for plant additions and improvements in 1959. Company hopes to complete its underground gas storage project at Brandywine, Maryland, this year as soon as underground storage rights have been acquired from certain area property owners that delayed project's completion in 1958. Recently completed was a main extensions project that required installation of 31,750 ft of 16, 8, 4, and 2-in. pipe to add new customers in new subdivisions in Maryland and allow for future growth in that area. Included in the installation was 7200 ft of 16-in. intermediate pressure line; 6800 ft of 8-in. lateral line to provide gas service to College Park Estates subdivision, and another lateral to the north of 4600 ft of 8 and 4-in. mains to supply new customers in the Lakewood subdivision. Balance of the mains laid were within the subdivisions. Completion of the project will also add new customers to company's mains in Berwyn Heights, Maryland.



Stockmen at Michigan Consolidated Gas Company's Allen Road Station in Detroit handle pipe against a backdrop of the holder at the company's nearby River Rouge Station.

Cincinnati Gas & Electric Company, Cincinnati, Ohio, plans to spend about $3,300,000 during the next two years to relocate gas and electric facilities as a result of street, highway, and other municipal improvements. Scheduled to be completed in 1959 is the underground cavern on Todhunter Road to store 6,000,000-gal liquid propane. Construction is currently underway on a $1,000,000 peak shaving plant one mile south of Middletown to process the liquid propane that will be stored in the cavern. During 1958, CG&E's gas department conducted a $6,897,-518 gas plant expansion program that included installation of 90 miles of new gas main and feeder lines to provide gas service to 4623 new customers. Peak day gas sendout during the year was 525,760,000 cu ft compared with 496,229,000 cu ft recorded during 1957.

Ohio Fuel Gas Company, Columbus, Ohio, has construction underway on a $30,000 project to tie-in six new gas wells in Perry and Muskingum counties with its distribution system. More than 2 miles of 4½ in. line is being laid northeast of Mt. Perry into Hopewell Township, Muskingum County to connect with an existing O-F line. Don Miller, Inc. is contractor on the project.

Honolulu Gas Company, Honolulu, Hawaii, is currently installing approximately four miles of ¾ to 4-in. main to supply 1790 housing units in three Navy Capehart housing projects, at Barbers Point, McGrew Point, and Camp Catlin. The Barbers Point subdivision will use butane supplied from two tank sites, each containing ten 1150 gal storage tanks. Camp Catlin will use city gas from a special 6-in. line being laid from the Puuloa holders and the McGrew Point units will be served from a 4-in. main running on Kam Highway near Aiea. Entire distribution system at Barbers Point will use for the first time in the territory a new plastic coated steel pipe to serve the 1140 units. Additional protection on the system will be supplied by use of anodes. During 1958, Honolulu Gas recorded a record daily gas sendout of 9,865,000 cu ft, equivalent to 50,774 therms, for a 6.6 increase over the previous record high established December 31, 1957.

The Gas Service Company, Kansas City, Missouri, is constructing a natural gas distribution system in Frontenac, Kansas, to serve approximately 658 customers. Approval of a 20-year franchise was recently given by the Kansas Corporation Commission. Project is scheduled for completion early in June. To provide adequate service to Frontenac, larger mains were needed in nearby Pittsburg, and approximately 7600 ft of 6 and 4-in. main in that city have been replaced with 8-in. main.

San Diego Gas & Electric Company, San Diego, California, has set a preliminary construction budget of $3,962,000 for expansion and upgrading of its gas facilities. Approximately $1,900,000 has been specifically tabbed for extension of gas service to new customers. The 1959 budget is the second largest budget in the company's history. During 1958, San Diego Gas added 15,406 new gas customers compared with 11,662 new gas customers added in 1957. By year's end company was serving a total of 235,123 gas customers.

Ohio Valley Gas Company, Columbus, Ohio, has completed a $77,000 construction project to improve natural gas service in Tiltonsville, Rayland, and Yorkville. Approximately 8000 ft of new 4, 6, 8, and 10-in. line was laid in two sections to replace existing smaller diameter lines. Baughman Contracting Company, Inc. was contractor on the project.

how pipe line engineers can sleep better

Dearborn's NO-OX-ID coatings and wrappers aren't exactly sleeping pills but the engineers who specify them for transmission or distribution systems don't have restless nights worrying about corrosion break-throughs.

NO-OX-ID provides both chemical and mechanical protection against moisture penetration and soil action. It is protection that lasts for decades – under ground and even under water. In tests, NO-OX-IDs have completely protected highly susceptible metals submerged in ocean locations year after year.

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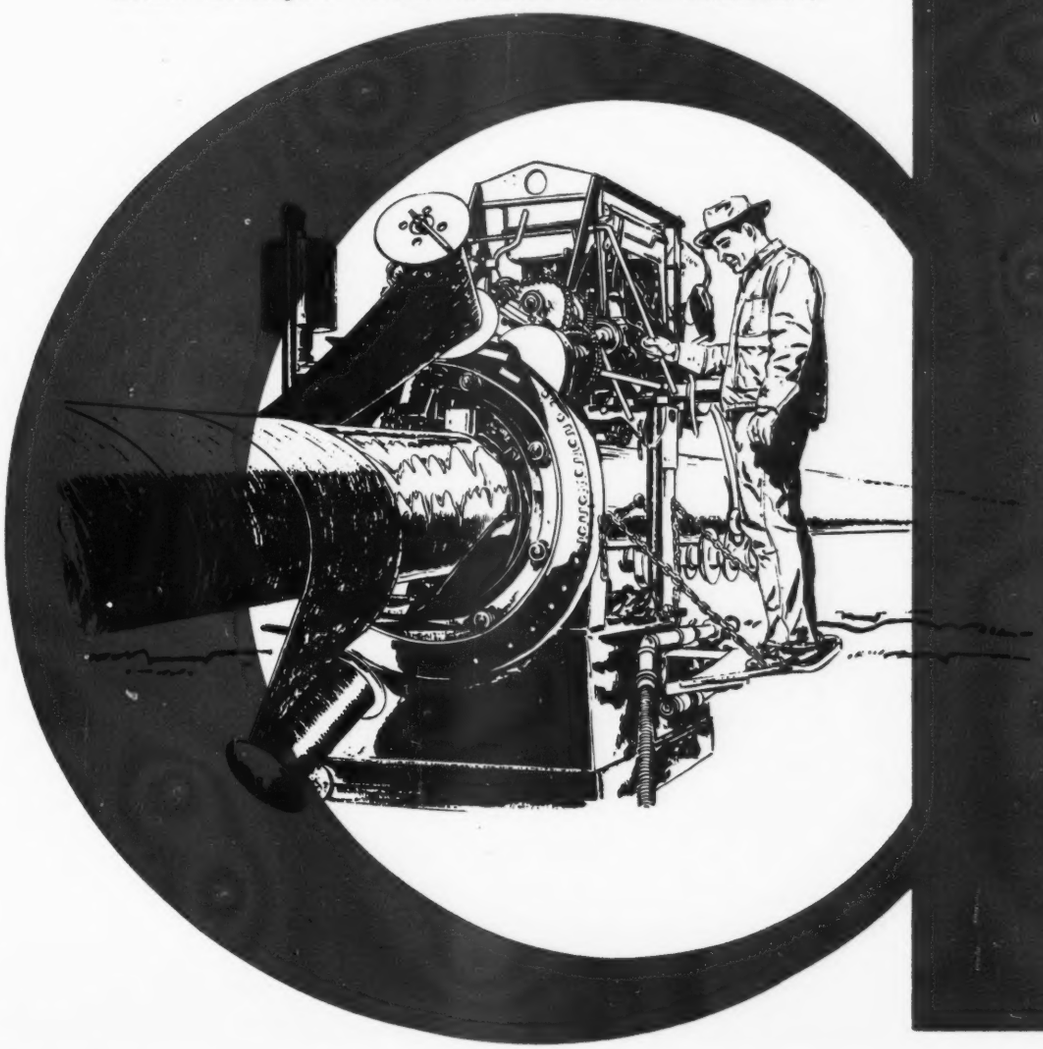

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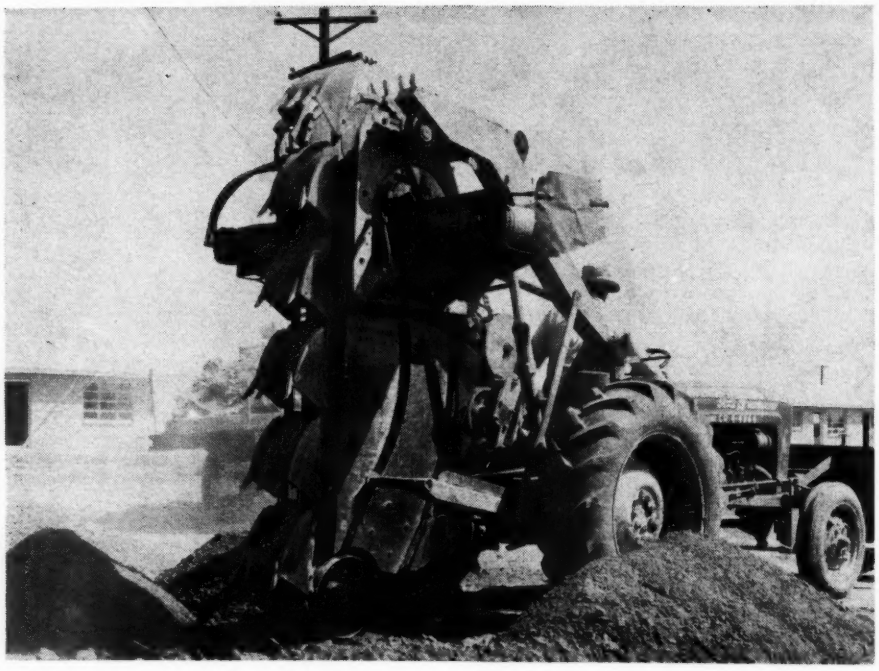
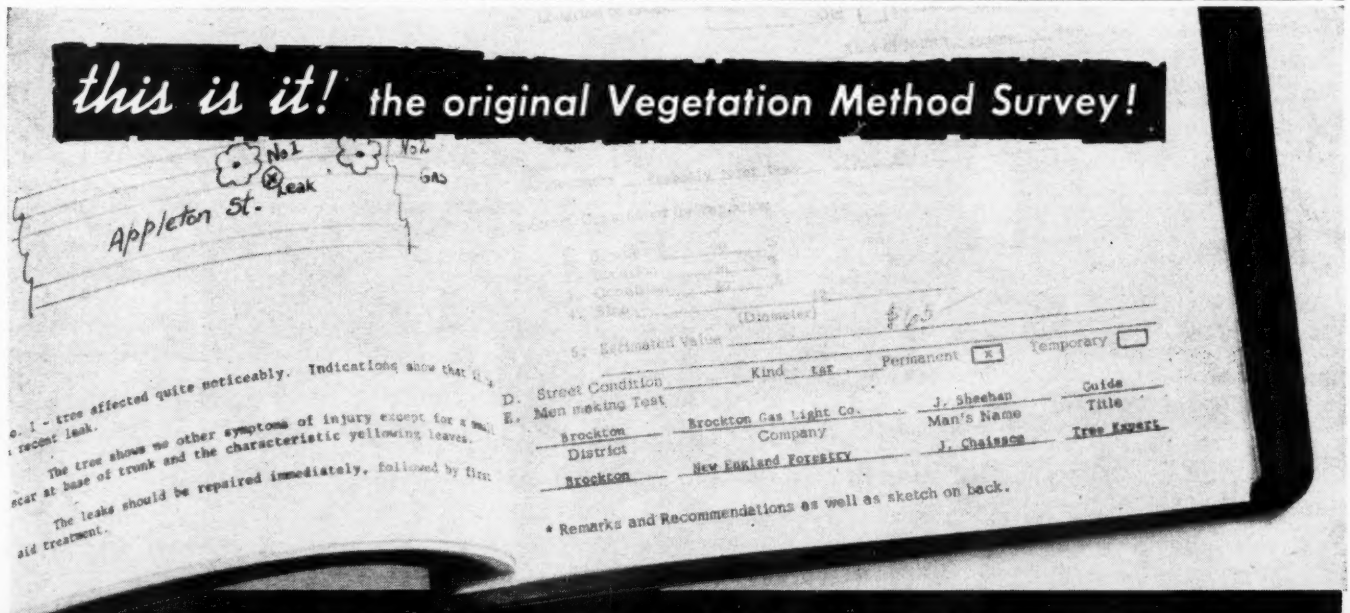


You can't tell until you test it... that's the theory on new equipment and methods followed by the gas department of Arizona Public Service... and applied to a new lightweight trencher used when running gas services in a new Phoenix subdivision. The tractor-mounted trencher proved so successful the utility decided to purchase one.

Four new communities in Illinois will receive natural gas for the first time as a result of FPC action authorizing Mississippi River Fuel Gas Company to supply Illinois Power Company with 2,202,000 cu ft a day for delivery to O'Fallon, Millstadt, and Hamel, and 1,518,000 cu ft for the City of Chester, Illinois. Illinois Power plans to spend $683,400 for gas distribution systems and plant to serve 7820 customers in the three communities. The City of Chester plans to spend $1,000,000 on its municipally-owned system to serve 6200 customers. Project includes $120,000 for interest during construction, $70,000 for "legal fees, financing, and miscellaneous," and $45,000 for engineering fees.

Consumers' Gas Company of Toronto, Ontario, Canada, plans to spend $25,000,000 to expand its gas distribution system in 1959. Negotiations are currently underway with various Quebec eastern township municipalities regarding gas distribution through a subsidiary. Consumers also plans to distribute gas through a subsidiary in Massena, Potsdam, Canton, and Ogdensburg, New York. Company recently acquired Shorgas, Ltd., a bottled propane gas distributing firm with plants at Whitby and Brighton on Lake Ontario. Consumers' recently purchased for $1,302,300 the City of Peterborough's propane gas system. A $647,000 19-mile 8-in. supply main has been extended to the city and expansion of the city's distribution system, estimated to cost $240,000, began in February. Conversion to natural gas was begun in mid-March. Contractors on the city work included Mid-Canada Contractors Limited, R. B. Somerville Company, Ltd., and Majestic Contractors, Ltd.



In June, 1934, the Brockton Gas Light Co. made history by using a commercially made Vegetation Method leak location survey.

Yes, 25 years ago a number of employees of a New England tree care company, among them Ernie Burnham, Leo Pimpare, Bix Bixler, and Jim Chaisson, discovered that, by vegetation survey, gas leaks could be accurately located on a commercial basis.

Two of these men, Jim Chaisson and Bix Bixler, founded SOUTHERN CROSS FORESTERS, which has become the largest, most complete leak location and repair service.

SOUTHERN CROSS FORESTERS

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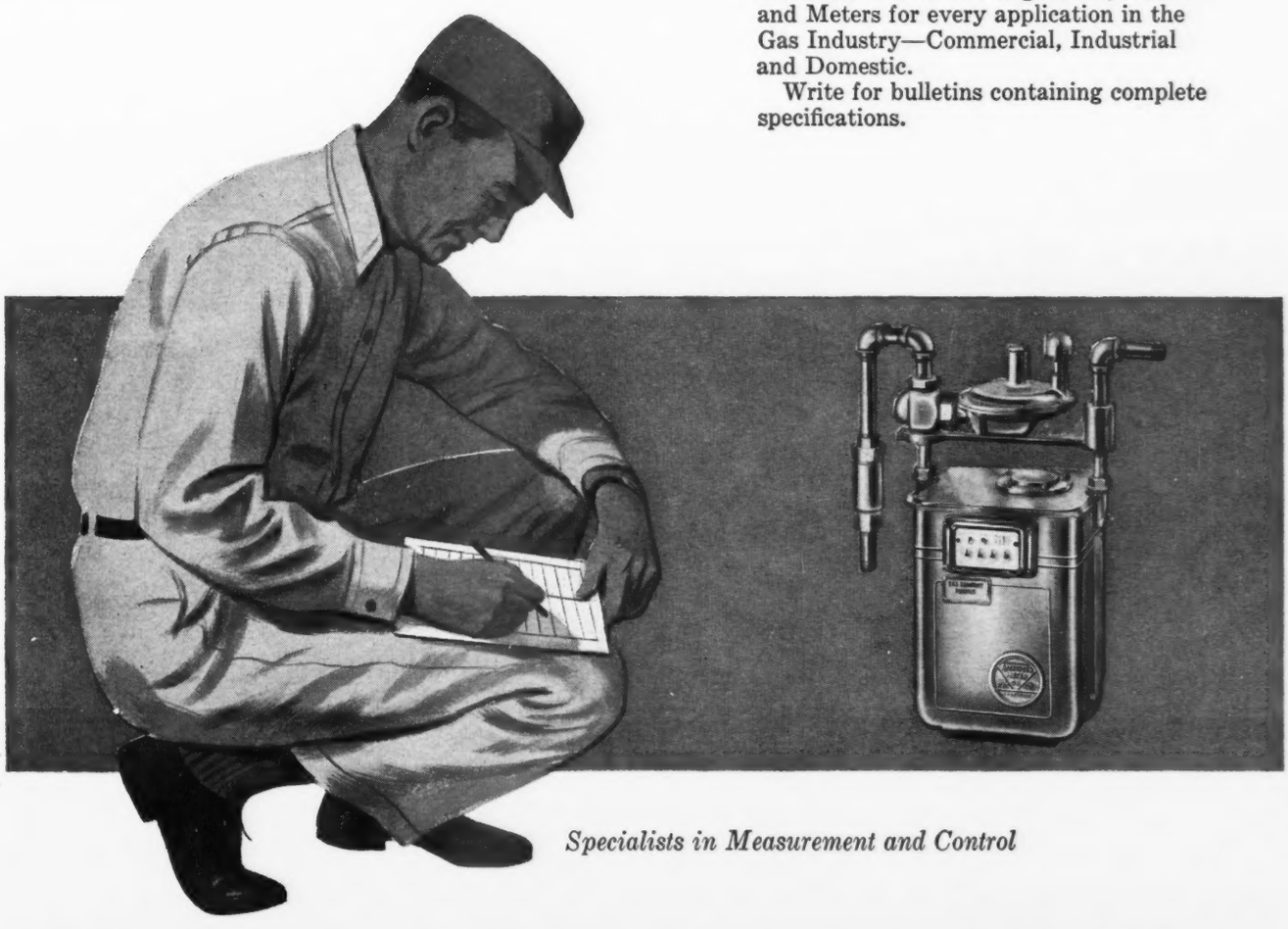
RELIANCE Series 1400 Meter Bar Regulators and Type "B" Filters provide positive control with simple accessibility and easy interchangeability. Rugged construction and compact dimensions provide the ideal control package for the Gas Industry.

AMERICAN Welded Steelcase Meters provide a new concept in the economics of meter maintenance and retirement. Sustained accuracy is built into these meters with proven speed ratio and the many refinements developed by American in over 120 years of meter engineering.

The perfect combination for measurement and control . . . Regulators, Filters and Meters for every application in the Gas Industry—Commercial, Industrial and Domestic.

Write for bulletins containing complete specifications.



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INCORPORATED (ESTABLISHED 1836)

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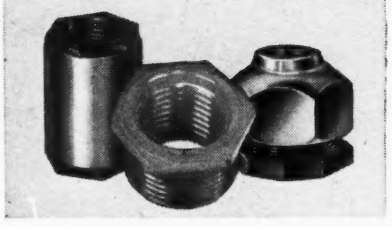


Stop electrolysis by insulating connections with MAYCO Dielectric Fittings or Dielectric Bushings. Bushings are toughest PLASKON nylon with extra-heavy "hex" gripping surface (on most sizes)...withstand pressures to 1000 lbs., temperatures to 300° F. Sizes to 2" for gas, plumbing, heating installations—wherever dissimilar metals are joined. Order from your jobber or write:

MAY PRODUCTS, INC.
GALESBURG, ILLINOIS
Manufacturers of MAYCO Dielectric Fittings — MAYCO Water Softeners

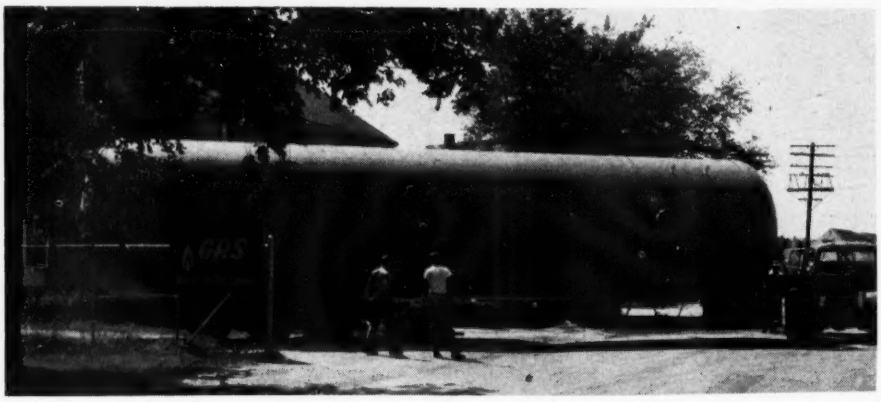
Tie-down on a load of coated pipe is loosened in preparation for unloading in the Poway Valley area, where San Diego Gas & Electric Company recently completed installation of 17,300 ft of 6-in. gas main to serve an area of 1200 to 1600 new homes. Another 3000 ft of 2-in. was laid in the area to serve a tract of new homes under construction.

Southern California Gas Company, Los Angeles, California, has underway a $185,000 "tie-in" construction project to augment supplies to the Redlands area of its Eastern division. Engineers, Limited is the contractor. Major part of the new project, which will give Redlands and adjacent Yucaipa and Calimesa areas a second major supply artery, consists of installation of 20,000 ft of 12-in. main to run from the Redlands plant and tie-in with a 12 and 16-in. line built in 1957 to supply the San Bernardino steam generating plant of California Electric Power Company.

Northern Illinois Gas Company, Aurora, Illinois, plans to spend approximately $158,000,000 during the next five years to add 30,000 new customers a year. Included in the record budget is substantially all of the $32,000,000 estimated to be needed for underground storage facilities and $13,500,000 for construction of a 140-mile natural gas supply connection with Northern Natural from East Dubuque to Des Plaines, Illinois.

Greater Winnipeg Gas Company, Winnipeg, Manitoba, Canada, plans to spend $4,640,000 for construction in 1959 to extend space heating service to approximately 50 percent of the dwellings in the Greater Winnipeg area. Aim is to make gas service available to the entire area by the end of 1963. Approximately 3500 new residential heating customers were added in 1958, slightly under mid-year expectations due to delays involved in receiving a government "go-ahead" on operations.

Public Service Gas Company, Newark, New Jersey, spent approximately $30,000,000 for construction of new gas facilities in 1958. Gas operations revenues set a new record of $114,999,863, an increase of more than 13 percent over 1957. Gas sales amounted to 718,821,532 therms, an increase of more than 15 percent over the preceding year. Also in 1958, a new record sendout of 5,084,473 therms of gas was noted on February 17. By year's end, PSG was supplying gas to 1,112,418 customers.



Easy does it. King-size 30,000-gal LPG storage tank arrives at the Dean Street plant of Norwood Gas Company, Norwood, Massachusetts, to bolster the utility's peak shaving plant storage. Two of the huge tanks, transported via truck from Pennsylvania, were erected above ground on concrete platforms.

DIG FAST... WORK CLOSE... CUT COSTS

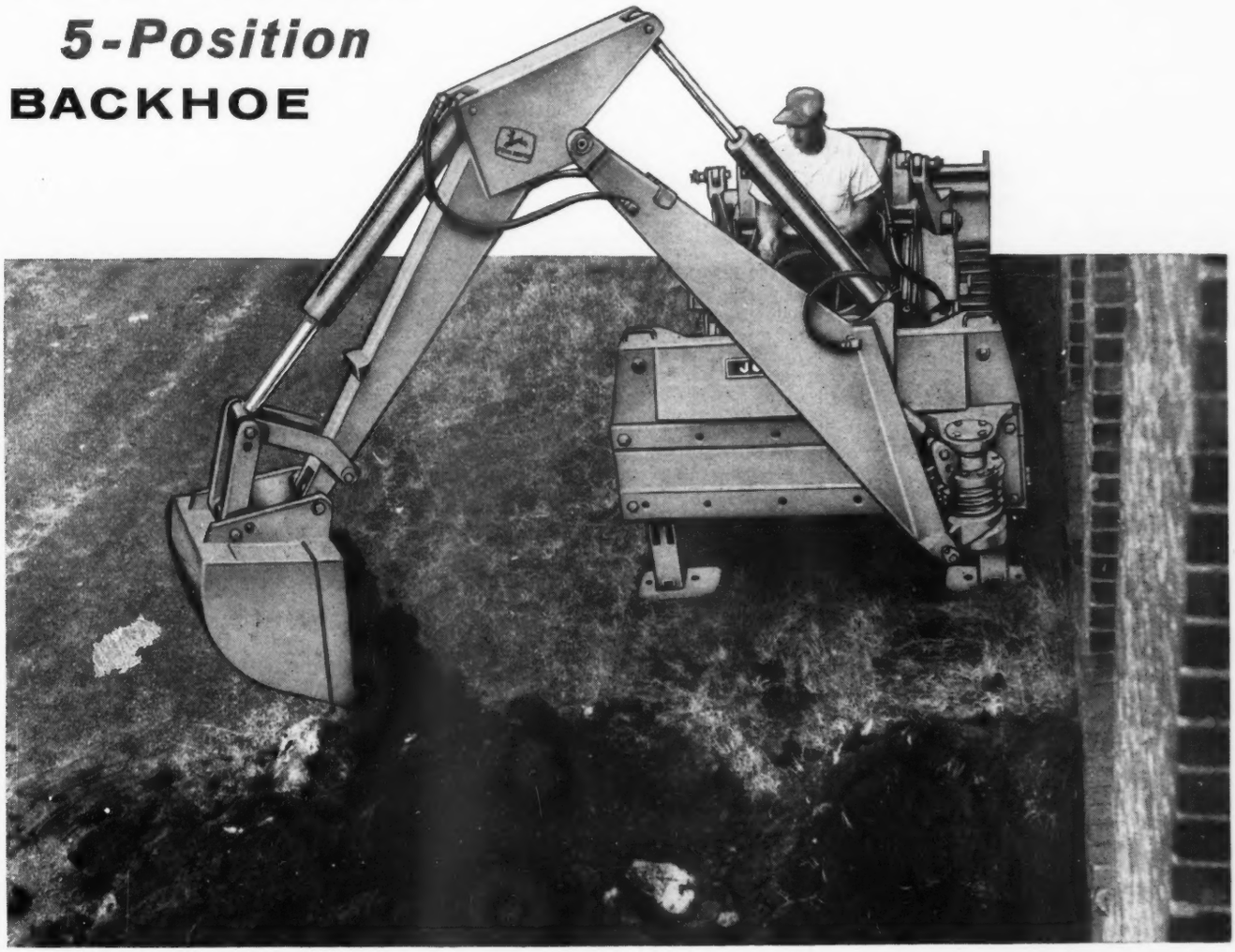
WITH A

JOHN DEERE *5-Position* BACKHOE

This new 5-position backhoe outfit takes full advantage of the increased engine horsepower built into every John Deere "440" unit, gasoline or Diesel. There's plenty of crowd pressure and bucket rollback to make fast work of digging in hard or frozen soils. And to speed work further, all movements of boom, dipper stick and bucket are operated by simple, 2-lever control.

Mounting the boom left or right for flush digging is just a matter of minutes for one man, using only a wrench. Boom cylinder and mount *slide* along the pad to any of five positions, moved by the boom's own hydraulic power. Mounted left or right, boom and dipper stick fold sideways against frame to make a compact, well balanced transport unit. Entire assembly can be removed from tractor in five minutes.

This is the kind of modern, efficient unit that cuts costs. Let your John Deere Industrial Dealer prove it with a demonstration.



Basics on the John Deere 51 Backhoe:

- **Boom travel—180 degrees • Ground level reach—20 feet, 9 inches**
- **Effective dumping height—11 feet • Maximum working depth—13 feet, 6 inches • Write Dept. 527 for detailed literature.**

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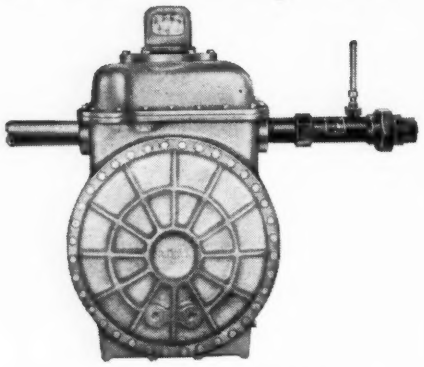
1000 psi working pressure critical flow prover



Designed for 1000 psi maximum working pressure, the new American® Critical Flow Prover provides economical proof testing of high pressure displacement meters in the field. The portable, precision-engineered design meets the highest standards of accuracy and dependability.

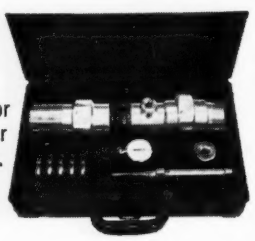
Available in 2-inch size with gas capacities from 250 to 6000 cfh. Each orifice individually calibrated.

SAVES MONEY
no costly set and removal expenses.

SAVES TIME
proof tests conducted on-the-spot.

SAVES EFFORT
no handling or transporting meters to the shop.

ASK
your American representative for Bulletin 203.1 for complete details.



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PRODUCT PARADE

MATERIALS – EQUIPMENT – SERVICES

FREE—Alphabetical list of more than 247 **major gas producers** serving the gas distribution industry. Available to all readers using the "ready-reply card" to obtain additional information on other items described in *Product Parade* and *Bulletin Board* departments of AMERICAN GAS JOURNAL.
CIRCLE (1) ON THE REPLY CARD

BUDGET-PRICED "SENTRY" MODEL of Arkla's Gaslite is now available from Arkla Air Conditioning Corporation. The "Sentry" is designed for post installation, features a two-tiered, ornate-style top with fluted edges and hinged tilt-back top for ready access to the interior of the gas light. New model, sixth light in the Arkla line, is designed to sell for approximately 50 percent less than Arkla's most popular 1958 model and still incorporates high quality standards of design and construction. Especially adaptable for multiple installations at industrial plants and warehouses.

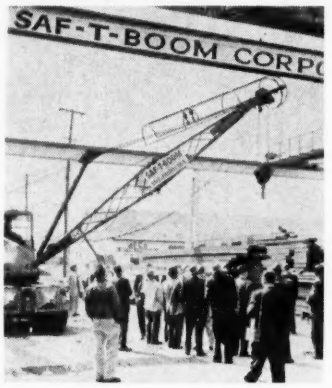
CIRCLE (2) ON THE REPLY CARD

ELIMINATE SPRING ITCH? Incidence of poison ivy or poison oak can be eliminated or substantially reduced through use by field personnel of E. D. Bullard's *Imunivy* and *Imunoak*. Substances are standardized non-toxic alcoholic extract of poison ivy or poison oak and can be given orally or injected intra-muscularly by a physician. Majority of companies currently using these products make them available to construction, maintenance and repair crews early in the spring and follow-up with monthly dosages until frost destroys the plants in the fall. Four 1 cc vials of extract are packaged as one unit.

CIRCLE (3) ON THE REPLY CARD

NEW 1959 MODEL M-3 Ditch Witch trencher manufactured by Charles Machine Works, Inc. features an all riveted 20,000 lb test digging chain; improved digging teeth, telescoping digging boom to provide correct boom length for every job. Unit is self-propelled, digs trenches 3 to 8 inches wide, 2 to 4 ft deep, at standard speeds of 1½, 3, or 6 ft per min.

CIRCLE (4) ON THE REPLY CARD

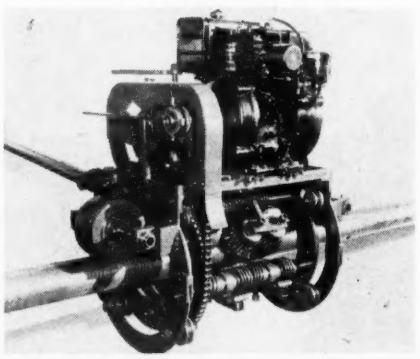


SAFETY DEVICE designed to protect crane booms from contact with overhead power lines and prevent death or injury to workers is being marketed by Saf-T-Boom Sales and Service Corporation of Dallas. Device is a weather-proofed protective shield made of steel tubing; four heavy duty insulators prevent flow of electricity to the machine and workers when the device comes in contact with power lines. Has been field and laboratory tested with more than 50,000 v, without by-pass or leakage. Unit is designed not to hamper operation of the crane or hamper the view of the operator.

CIRCLE (5) ON THE REPLY CARD

VICTOR ADDING MACHINE COMPANY has announced new 1959 Champion line of precision-built large capacity adding subtracting machines. Models range from electric subtractors with credit balance to the small sturdy-built hand-operated adders. Choice of 10-key or full keyboard models have such features as exclusive printing press action, automatic punctuation, and automatic space-up.

CIRCLE (6) ON THE REPLY CARD

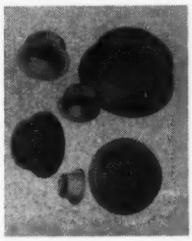


LIGHTWEIGHT, SELF-PROPELLED pipe cleaning machine manufactured by Remco is designed for new pipe as well as for maintenance and repair work on existing pipe. Unit cleans up to 25 ft of pipe per minute, and requires only 6-in. clearance under the pipe. Is easily installed by two men, and once attached to pipe can be operated by one man as it is self-propelled. Collars, patches and bell and spigot pipe are no problem as floating design of cleaning head permits easy passage over such obstacles. Machine is available in five models each of which will clean four successive sizes of pipe from 2 through 24-in. All models can be supplied with primer attachment, taping attachment, stationary base, and recoil starter.

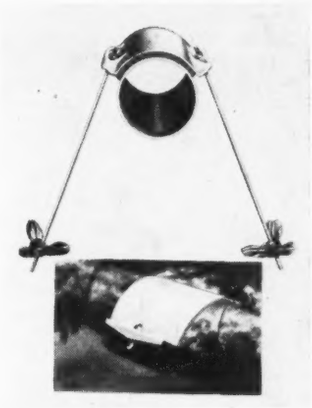
CIRCLE (7) ON THE REPLY CARD

PRODUCT PARADE

COLOR CODED plastic protective plugs, developed by Protector Products, are designed to simplify inventory and stock room operations. Easy-to-read size measurements are molded into bottom of each plug. Available in sizes from ⅛ to 1-in. inclusive for all standard internal pipe threads. Suggested uses include protection of bored, ground, polished, plated, or painted internal surfaces; and masking of surfaces during plating, coating, and painting.



CIRCLE (8) ON THE REPLY CARD



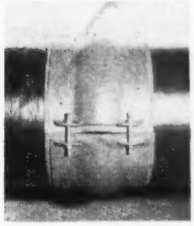
EXPANDING ANCHOR AND PIPE SADDLE for river and marsh land holddown problems is now available from Grip-Tite Company. Units have been specifically designed to avoid damage to protective coating and for permanent holddowns of all kinds of pipeline construction. Assembly is made of certified malleable iron, and the pipe saddle is made of 10 gage sheet steel, hot dip galvanized after stamping.

CIRCLE (9) ON THE REPLY CARD

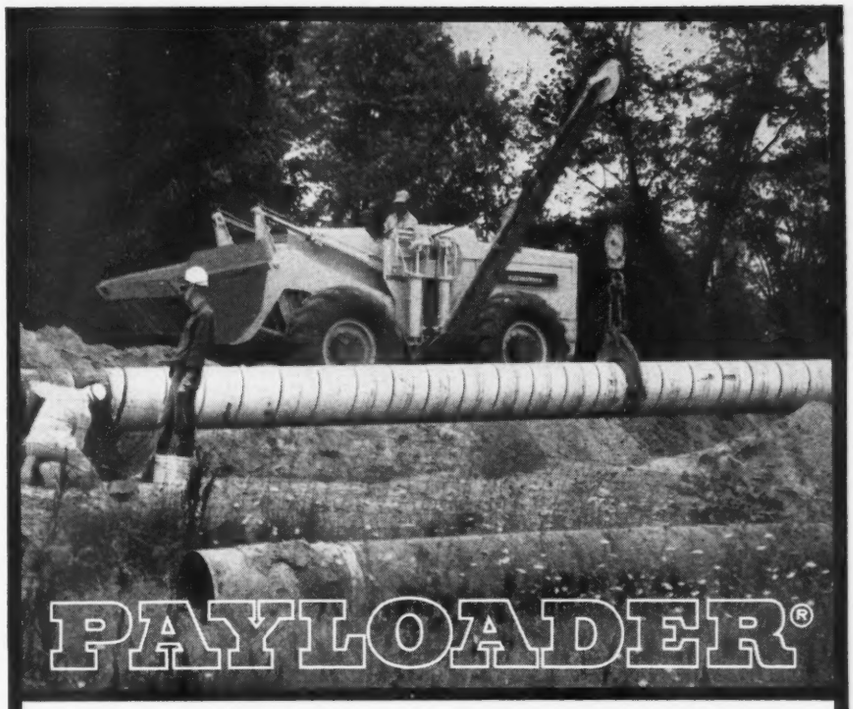
NEW MEDIUM-WEIGHT PAVING BREAKER manufactured by Davey Compressor Company is suitable for all but heaviest demolition jobs; features complete housing by cylinder of the entire valve mechanism. A single hat-shaped, short-travel main valve controls high speed piston. Handle is fitted with an outside type trigger, and throttle valve has replaceable leak-proof rubber seating. Main valve assembly is held rigidly in the cylinder by rubber buffer which eliminates much of the vibration usually incident to air tool operation.

CIRCLE (10) ON THE REPLY CARD

DRESSER'S NEW CASING INSULATOR permanently protects carrier pipe from crossing casings, as well facilitating pipe installation. Manufactured of high strength ⅛ in. steel, insulator's special shape minimizes drag friction when threading carrier pipe through the casing. The one point steel contact of the insulator-to-casing allows pipe to slide easily and there are no runners or other protuberances to tear off.



CIRCLE (11) ON THE REPLY CARD



fast, rubber-tired Side Boom handles many pipe line jobs

Equipped with a SUPERIOR-HOUGH hydraulic side boom, the "PAYLOADER" tractor-shovel provides you with a handy, versatile crane, for unloading or loading pipe; stringing and lowering-in; holding for coating, wrapping or welding; handling valves and supplies. With its bucket it can be used for backfilling, clearing and loading out excess spoil.

COMPLETE HYDRAULIC CONTROL

The boom has complete hydraulic control and power — lifts up to 10,000 lbs. at 4′ overhang. Boom telescopes from 10 to 16 feet. Cable drum has free spooling safety release.

PREVENTS DAMAGE

Huge rubber tires provide sure-footed traction and flotation in sandy and muddy soils . . . and prevent damage to paved surfaces and landscaping along right-of-way. It's fast to the job (travels over streets, highways or cross country) and fast on the job. No trailer required.

Put this versatile side boom on your job and see how much more work, and many more jobs it can handle. Your Hough-International Distributor will provide complete details, or return the coupon for literature.

A fast loading and unloading crane out on the job or in pipe pre-coating areas. Does not damage paved surfaces. Ideal for stringing on paved surfaces or cross country. Trench-hoe, winch, black-top spreader, and many other attachments.

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AG 3-B-8

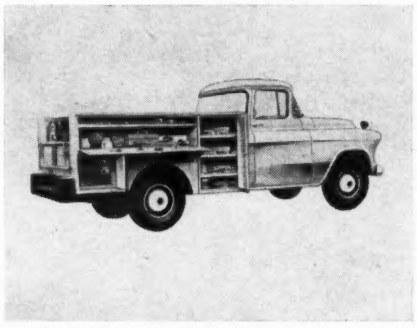
PRODUCT PARADE

NEW GAS LIGHT, called the Vari-Ray Gas Lamp, can be turned on and off from inside the house and the light intensity controlled to give variable brightness. The lamps, manufactured by Trageser Copper Works, are available for any gas, and supplied complete with lamp head, pressure regulator, post and remote operating control assembly. Completely weatherproof, lamp is unaffected by wind or rain.

CIRCLE (12) ON THE REPLY CARD

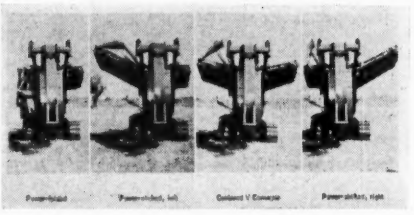
NEW MODEL 220 DAVIS BACKHOE has hydra-slide positioning that permits one man to move the entire digging assembly along the frame to any of five positions in less than five minutes. Operator's seat and controls move right along with digging assembly so operator is always directly in line with his work. Other features of new model are increased operating pressure to 2150 psi, larger bucket cylinder for 50 percent faster dumping, and greater breakaway power up to 14,000 lb. Backhoe attaches directly to the Davis Loader utilizing the same hydraulic system; is available for all Massey-Ferguson tractors.

CIRCLE (13) ON THE REPLY CARD



NEW SERIES of job-planned utility truck bodies that give the gas distribution industry "file-box" convenience in organizing storage of tools, materials, supplies, and equipment are being manufactured by Reading Body Works, Inc. Removable shelf and tray dividers, similar to those in file drawers, and removable shelves allow truck operators to vary vehicle's interior compartment arrangement to suit each day's requirements. Shelves are mounted on special die-formed steel brackets and can be changed instantly without tools.

CIRCLE (14) ON THE REPLY CARD



CLEVELAND 240 TRENCHER, popular model for digging trench up to 3 ft wide and 6 ft, 3 in. deep, is now equipped with a 12-ft power-shifted power-folded, V-shaped conveyor. Both shifting and folding are lever-controlled at the operator's seat. Conveyor provides constant elevating angle for faster, higher spoil discharge and provides maximum clearance under digging wheel rims. Power-folding brings 12-ft long conveyor down to within the 240's 8-ft overall width, allowing over-the road transport without special highway permits.

CIRCLE (15) ON THE REPLY CARD

ROBERTS-GORDON APPLIANCE CORPORATION has entered the gas lighting field with the introduction of its *Lampadaire* gas light. Made of heavy gage steel, lamp is double weatherproofed with black lustrous, long-lasting finish. Two styles, Colonial and Suburban, are available.

CIRCLE (16) ON THE REPLY CARD

DESTINATION: TOMORROW!

WHEN OUR FIRST MANNED ROCKET SHIPS EQUIP FOR TAKE-OFF T&R SILICONE AND SEMI-CIRCLE SPRING ELECTRODES WILL BE A MUST.

THE SE/1 IS A SPECIALLY DEVELOPED ELECTRICALLY CONDUCTIVE, FLEXIBLE, SPECIALLY MOULDED AND COMPOUNDED SILICONE RUBBER ELECTRODE FOR USE WITH ANY HIGH VOLTAGE HOLIDAY DETECTOR UNIT.

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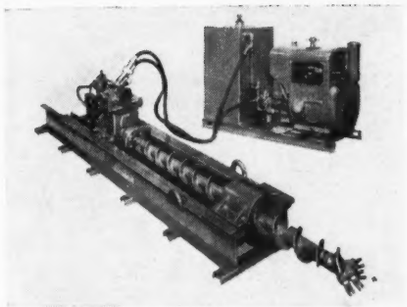


NEW LINE OF TRENCH DRILLS allow contractors to drill holes and lay pipe without breaking paving or disturbing the surface or disrupting traffic. The units, manufactured by Salem Tool Company, operate in a trench dug to the depth at which the pipe is to be laid; an auger rotates inside the pipe and advances the pipe as the hole is drilled, thus drilling the hole and pushing the pipe simultaneously. Auger flights feed the drilled earth back through the pipe. Drills handle augers 4 to 24 in. in diameter and 2 to 6 ft in length.

CIRCLE (17) ON THE REPLY CARD

NEW SMITH SPLIT-COUPLING for pipeline repairs, to be introduced by Pipe Line Development of Cleveland at the International Petroleum Exposition, can be used as a coupling, split sleeve, or as a pipe repair clamp. Split-longitudinally, coupling is all steel and can be welded solidly and permanently when necessary. Otherwise, only assembly work required in the field is placing two halves of split-coupling around the pipe and tightening the side bolts. Available in sizes 2 to 4-in.

CIRCLE (18) ON THE REPLY CARD

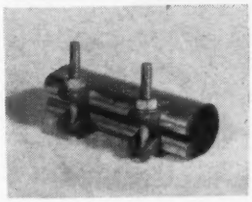
KIMRAY'S NEW GLYCOL PUMPS for gas dehydrators feature low gas consumption; no auxiliary power supply as the power source is wet glycol from the absorber plus a small amount of gas; and a completely sealed system to prevent loss of glycol. Pump capacities range from 17, 40, 90, 210, and 450 gal per hour.

CIRCLE (19) ON THE REPLY CARD

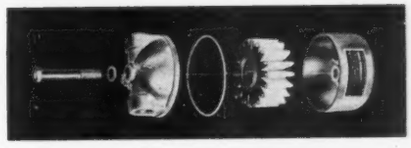
NORGE'S NEW AUTOMATIC CLOTHES DRYER for self-service laundry stores operates at low temperature with a 120 deg air flow. Coin-operated dryer has a safety thermostat, metal clothes gasket guard, safety knee door opener, and automatic door switch. Cylinder — 29 inches in diameter — has a non-sticking surface which is non-wearing to clothes, and minimizes wrinkling. Drys all types of fabrics.

CIRCLE (20) ON THE REPLY CARD

NEW BAND-TYPE PIPE REPAIR CLAMP developed by Dresser Manufacturing Division quickly repairs leaks or breaks in steel piping. Individual components of clamp are carefully constructed: Lugs are made of malleable iron and shop-coated for added protection; band is made of stainless steel for greater strength and corrosion resistance; and the rubber compound gasket is resistant to all common pipeline contents including condensates, aromatic and aliphatic hydrocarbons and retains resilience after years of use. Clamps are available for pipe sizes ½ through 8-in., in 3, 6, 9, and 12-in. lengths.



CIRCLE (21) ON THE REPLY CARD



NEW COMPRESSED AIR FILTER, consisting of 6 parts assembled by a single bolt, has been developed by Dollinger Corporation. Constructed of die cast aluminum, the inlet and outlet pipe connections of filter are ¾ or 1-in. Capacity of unit is 600 scf/hr with an initial pressure drop of 1-in. of water. Design pressure is 125 psi. Unit is 5¼ in. high and 4½ in. in diameter.

CIRCLE (22) ON THE REPLY CARD

THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Insulating Fittings

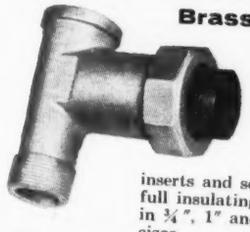
Malleable Service Ell

The insulating principle depicted above is carried out in all Normac Ells and Tees.

Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

New CATALOG

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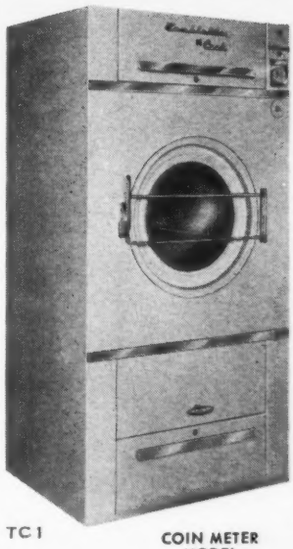

TC 1

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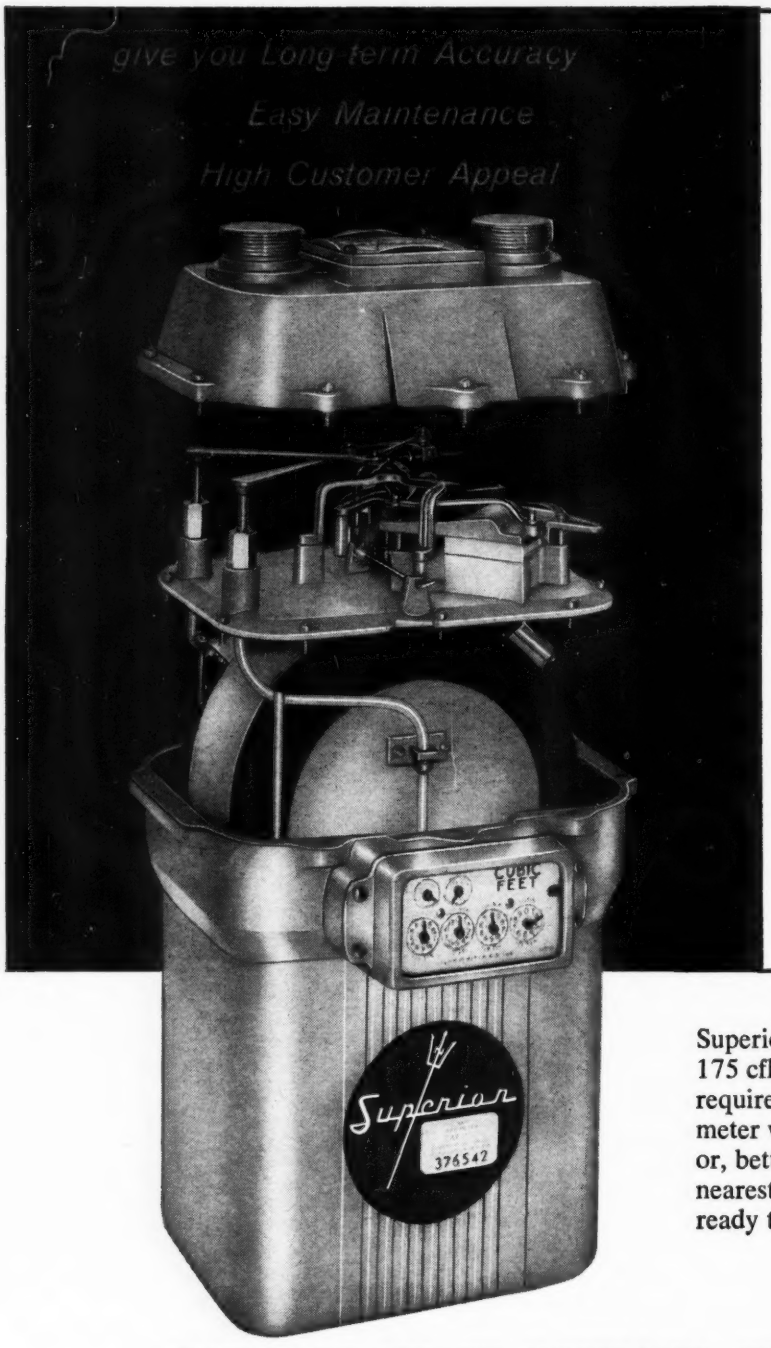

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13. **Broad base for conveyorized handling. Flats on top permit solid stacking.**
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16. **Conforms to latest A.G.A. standardization specifications.**

Superior now manufactures aluminum case meters in 175 cfh, 250 cfh and 340 cfh sizes to meet most domestic requirements. To find out how this advanced-design meter will fit into your planning send for bulletin 1150... or, better still, phone the Superior representative nearest you. He understands your needs and stands ready to give you good, quick service.

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15

NEWSREEL

Gas Infra-Red Finds New Use

Use of gas infra-red heat to cure molded concrete products has cut in half the number of forms required and reduced the delivery time for each lot for Fifer Industries, Inc., of Louisville, Kentucky. Forms for steps, splash blocks, sills, chimney caps and other specialty items may now be used at least twice a day instead of once.

After forms are poured, one or more portable propane-fired infra-red generators are moved into place for curing and adjusted to radiate over the entire top surface of the forms. Forms are removed after 1½ hours of infra-red curing. The concrete is wet down several times a day after removal from the forms to achieve uniform curing.

Previously, Fifer left concrete in the forms overnight. As most of the company's products are designed for a particular construction job, a new set of metal forms, costing an average of $90 each, is required for each production lot. Fifer's production ranges from 30 to 1000 pieces.

The portable heaters used are made by Perfection Industries, division of Hupp Corporation. Rayheads are of the same type used for heating high-bay factories and other industrial buildings with propane or line gas.

MICHIGAN CONSOLIDATED GAS COMPANY'S transit ad has been selected as the NATA "Car Card of the Month," in a competition judged by Philadelphia advertising agency principals. Selected from among 90 entries from all parts of the country in the National Association of Transportation Advertising's monthly competition, the winning car card was one of a series prepared for the American Gas Association and offered to gas companies throughout the country.

REXALL DRUG COMPANY has acquired Chippewa Plastics, Inc. subject to approval of Chippewa stockholders by the exchange of one share of Rexall stock for two shares of Chippewa common stock with appropriate adjustments for Chippewa preferred stock. Plans are to operate Chippewa Plastics as an independent division under present personnel with headquarters continuing at Chippewa Falls, Wisconsin.

TUBE TURNS DIVISION of Chemetron Corporation plans to enter the flexible piping components field with a complete line of bellows expansion joints. Initial production of the stainless steel joints will be in 3 to 30-in. nominal pipe sizes for applications up to 275 psi and 750 F. A. R. C. Markl, authority on industrial piping and Tube Turns' research consultant, was in charge of development of the new product line which will be first in the industry to offer a test-rated inter-relation between traverse, pressure, and cyclic life. Principal application of the new bellows expansion joints are where restricted space makes it uneconomical or impossible to install expansion loops to absorb pipe expansion and contraction, such as occurs in steam distribution plants, petroleum refineries, and natural gas services.

Liquid Methane Unloaded; Put Into London Gas Lines

Gas made from liquid methane and shipped to London from the Gulf of Mexico in the history-making voyage of the "Methane Pioneer" is being pumped into London's gas supply lines. The first cargo of liquid methane arrived February 20 but was not unloaded until three weeks later on March 11. Technicians from the British Gas Council made extensive tests to take full benefit from the lessons to be learned from the first trans-Atlantic shipment of the liquid natural gas. The British Gas Council was quoted as saying the first experiment with the gas had been "very successful."

DURING THE CENTENNIAL YEAR of oil and its sister fuel "natural gas," Tidewater Natural Gas Company, present owner of the distribution franchise in Fayetteville, North Carolina, has decided to switch from its 100-year-old use of manufactured gas to natural gas. Conversion cost is estimated at $3,500,000. Natural gas will be supplied by Transcontinental Gas Pipe Line Corporation from southwest Texas. The original gas franchise was given the Fayetteville Gas Light Company in 1859.

GAS AND THE ATOM, new PAR Public Information booklet answers commonly asked questions about the effect atomic energy will have on the gas industry in light of the latest available scientific and engineering information. Booklet brings up-to-date an earlier edition by the same title, and has been designed for distribution to opinion-forming groups, and mailing to stockholders with company annual reports.

Russians will get a peek at U. S. "Kitchen of Tomorrow." Whirlpool Corporation has been chosen by the U. S. Department of State and the U. S. Department of Commerce to display both a gas kitchen of the future and a modern gas kitchen of today at the American National Exhibition in Moscow, first official U. S. Government display ever held in Russia. In Whirlpool's electronic Miracle Kitchen of tomorrow, the Russians will get a look at a transparent self-cleaning oven that bakes a cake in three minutes, an automatic dishwasher that "walks" across the floor to the table, loads, scrapes, washes, dries and stores dishes, a remote-controlled floor cleaner of the future that scrubs, mops, vacuums, waxes or polishes floors. The Miracle Kitchen also contains a built-in closed circuit TV system that serves as an electronic baby sitter. All devices are controlled remotely from the free-standing planning center (upper left).

(Continued from page 25)

the bottom of the "V's" touching the inner cylinder. The top ends rest against the outer shell of the container. When a reaction is begun in the inner cylinder, the rods are heated to 1100 F at point of contact with the inner cylinder and are cooled at the outer, open end, setting up the required hot and cold series to produce electrical current.

The initial model was fueled with Polonium 210 — which has a half-life of 138 days. Cerium 144 can also be used as a fuel — which would provide fuel for 10 months. By using Plutonium 238, the device conceivably could supply power for 90 years.

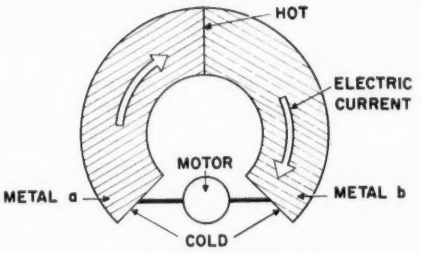
At present, the experimental model produces 2.5 watts. Fully fueled, it could produce an estimated 5 watts.

Plasma Thermocouple

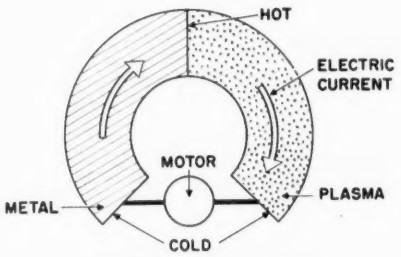
Hailed as a new type of power generator, the plasma thermocouple was developed at the Los Alamos Scientific Laboratory by five scientists — G. M. Grover, William Ranken, D. J. Roehling, E. W. Salmi, and R. W. Pidd, the latter a consultant from the University of Michigan.

The plasma thermocouple is unique in that it uses an electric plasma — a "fourth state of matter" that is currently attracting the interest of physicists.

In the normal thermocouple, two metals are employed, fused together. The new device uses only one metal, with the other replaced by an ionized gas that is used as a "plasma." With a steady input of heat energy, a large steady flow of electrical energy is produced. The plasma thermocouple is described as being far more efficient because the plasma's driving force is about 1000 times greater than that of any metal. * * *



BIMETALLIC THERMOCOUPLE

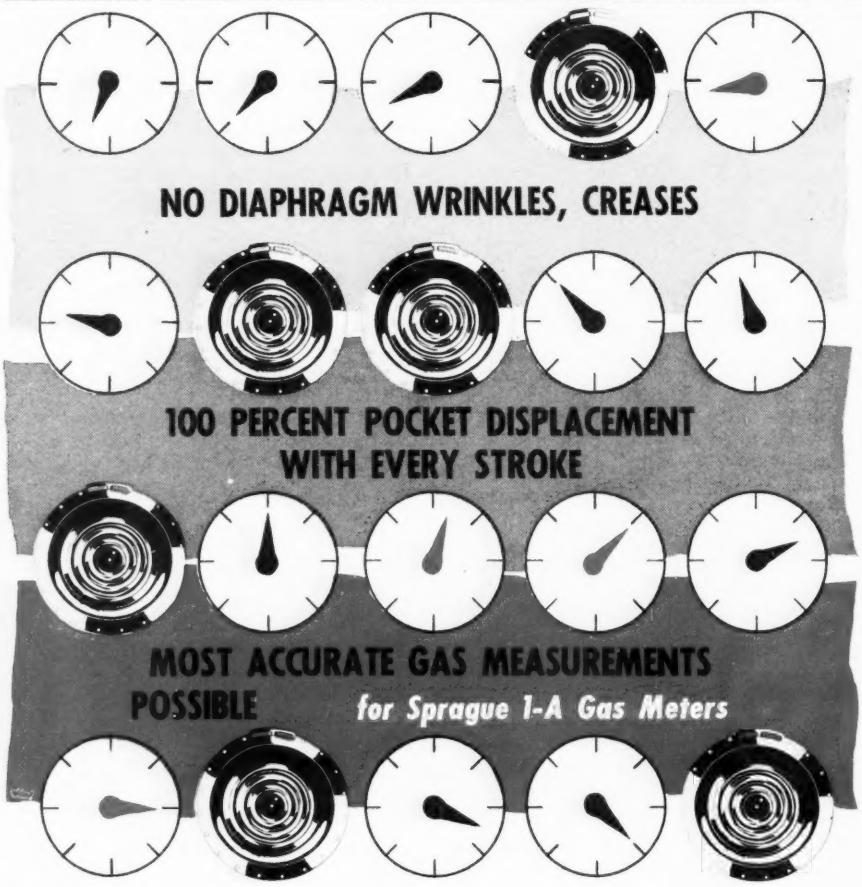


PLASMA THERMOCOUPLE

Very much simplified, these schematic drawings omit such details as methods of plasma confinement and means of electrical contact with the plasma. The drawings are intended only to show the essential difference between two kinds of thermocouples.

Bimetallic thermocouples have been in use for many years, largely for temperature measurement and control. They operate on the principle that when two dissimilar metals are in electrical contact with each other at two places having different temperatures, an electric charge flows around the circuit. The strength of this current is dependent on the temperature difference and the properties of the materials.

Every conductor has a characteristic thermal driving force which physicists call "thermoelectric power." Since the two metals in an all-metal thermocouple have different driving forces, current is driven in one direction in the circuit, depending on which driving force is the greater. The reason why the plasma thermocouple works so well is that the plasma's driving force is about 1000 times greater than that of any metal.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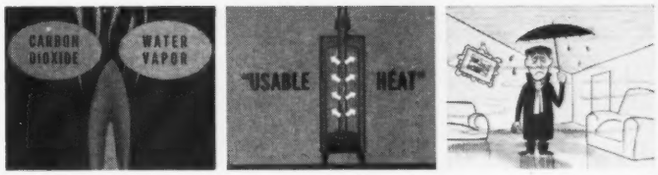
Every utility service-man will readily grasp the importance and the principles of correct gas venting after seeing the new Metalbestos 27-minute color strip film, "Heat in Harness: The Story of Gas Venting." The first film devoted exclusively to the subject of gas venting, "Heat in Harness" corrects many popular misconceptions about gas venting . . . presents accepted venting practices in a fresh and original manner.



From the gas flame . . . through the appliance . . . into the home itself.

"Heat in Harness" traces the correct path which vent gases must follow in order to insure complete health and safety to your customers.

"HEAT IN HARNESS" *is already part of the curriculum of many utility training programs. To learn how you may obtain free showings of this educational and entertaining film, write to Dept.*

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BULLETIN BOARD

CATALOGS – BROCHURES – TECHNICAL DATA

ADVANTAGES of Republic SRK plastic pipe for both new service line installations and insertion through existing corroded lines are described in new catalog sheet just published by Republic Steel. Sheet describes and illustrates how to join plastic pipe in combination with both steel and plastic mains.

CIRCLE (61) ON THE REPLY CARD

TECHNOLOGY OF PLASTIC PIPING systems, plastics used in piping systems, installation and coupling methods, standards for plastic pipe, temperature and working pressure chart for valves and a table showing effects of 280 chemicals on 5 different plastics used in Chemtrol valves are described in new 16-page handbook.

CIRCLE (62) ON THE REPLY CARD

NEW GAS CATALOG from Dresser Manufacturing Division, Dresser Industries, describes use of couplings, fittings, and pipe repair products on gas mains and distribution systems. Product information and installation instructions are included as well as piping diagrams and product and installation photos. A separate edition of the catalog is available for Florida.

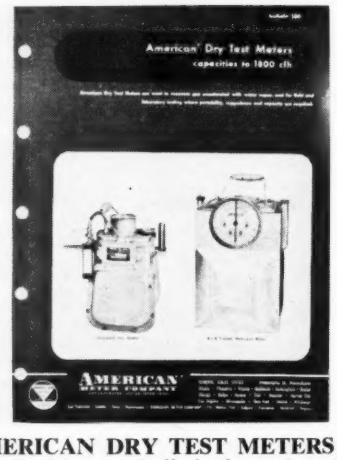
CIRCLE (63) ON THE REPLY CARD

DESCRIPTIVE LITERATURE on Charles Machine Works' newly-introduced Model M-3 Ditch Witch trencher is now available. New model is self propelled; trenches 1200 to 1400 ft per 8-hr day; can dig trench 3 to 8 in. wide, 2 to 4 ft deep. Construction features and applications of equipment are given and equipment photographs amplify the explanation.

CIRCLE (64) ON THE REPLY CARD

NEW BULLETIN describes Dollinger's compressed air filter. Constructed with a die cast aluminum base and head, the filter is held together with a single bolt, washer, and gasket; has overall dimensions of 5¼-in. by 4½-in. diameter with a capacity of 600 scfh with initial pressure drop of 1-in. of water.

CIRCLE (65) ON THE REPLY CARD



AMERICAN DRY TEST METERS are described in new bulletin from American Meter Company. Detailed information is given on a variety of dry test meters including tinned steelcase meters with totalizing indexes, the charcoal test meter, tinned steelcase meters with hourly-rate dial, and ironcase with aluminumcase meters with totalizing indexes.

CIRCLE (66) ON THE REPLY CARD

DATA SHEETS with complete application information and specifications on Foxboro's gas flow computers are now available. Computers, designed for gas distribution company use, provide continuous up-to-the-minute flow data for gas dispatching. Basic computing systems include units for single meter run and multiple meter run stations. Combinations of these provide custom designed systems to meet the exact needs of each users. Computers solve the flow equation and provide a chart record of corrected flow. Correction for gas temperature is automatic; corrections for supercompressibility and specific gravity factors can be manually set.

CIRCLE (67) ON THE REPLY CARD

AMERICAN DUCTILE IRON products are described in new 36-page illustrated catalog published by American Cast Iron Pipe Company. Technical information including grades, specifications, dimensions and weights, uses and applications are given. Ductile iron products supplement America's already-complete line of products available in sizes 2 to 48-in. diameters.

CIRCLE (68) ON THE REPLY CARD

CONSOLIDATED ELECTRODYNAMICS' MicroSADIC high-speed digital processor for static and quasi-static test data is described in new 6-page 2-color bulletin. Unit accepts and commutates analog signals, converts them into digital form, and records on magnetic tape in a programmed format suitable for introduction into most standard electronic computers. Can commutate up 10,000 signals per second. Features choice of 16-program formats, transistorized electronics, selection of binary and binary-coded-decimal systems and low power requirement.

CIRCLE (69) ON THE REPLY CARD

SURVEY OF WELDING EQUIPMENT AND INDUSTRIAL REGULATORS has been published in new 24-page brochure from Modern Engineering Company. Illustrated with cross-section drawings, brochure evaluates 50 important design features found in oxy-acetylene welding and cutting equipment and industrial regulators produced by 19 leading manufacturers. Twelve pages are of especial interest to welding department superintendents and plant maintenance superintendents, and the 12 pages on regulators are of especial interest to engineers who work with air-activated equipment or commercial gases.

CIRCLE (70) ON THE REPLY CARD

BOOKSHELF

Guide to Technical Reports, *Henry Dan Piper and Frank E. Davie, published by Rinehart & Company, Inc., 232 Madison Avenue, New York 16, New York. Pages, 83. Price, $1.*

Guide provides directions for converting raw technical data into finished report. It is divided into three parts, and discusses fundamental principles of report writing, describes various kinds of reports, and outlines process usually followed in writing report. Difficulties in punctuation, grammar, and style are discussed in Part 3. One of the Rinehart English pamphlets series, booklet is based on manual authors prepared for Shell Oil Company technical people. It is a brief, inexpensive, comprehensive manual for beginners, that emphasizes grammatical difficulties most frequently encountered in report writing.

The Working Press of the Nation, *published by The National Research Bureau, 415 North Dearborn Street, Chicago, Illinois. Pages: Vol. 1, 467, Vol. 2, 520. Vol. 3, 470.*

The three volumes of the new revised and enlarged 1959 edition of this directory constitutes a complete reference library of all media of communications. More than 100,000 publishers, editors, writers, and broadcasters are listed. Vol. 1 covers newspaper and allied services, and lists newspapers, news services, feature syndicates, newsreels, photo services. Vol. 2 covers the magazine field including service, trade, professional, industrial, agricultural, consumer, and news publications; contains alphabetical and group indexes for over 2600 magazines. Vol. 3 on radio and television, lists names and descriptions of local programs with personnel involved, and complete data about all major radio and TV stations, including power, news service, and executive personnel.

Developing Executive Skills, *published by American Management Association, Inc., 1515 Broadway, Times Square, New York 36, New York. Pages, 425. Price, $9.*

Comprehensive handbook for companies concerned with executive performance, shows how to organize, carry through, and evaluate a management development program; how to deal with special problems involved in management development (setting up a favorable climate, re-organizing the company structure, etc.); how to appraise personnel fairly and realistically from the initial evaluation to the crucial post-appraisal interview; and how to select development techniques tailored to manager's individual requirements. Many specific development methods are described in detail, including coaching, job rotation, multiple management, the problem solving conference, and role-playing.

The Gebbie Press House Magazine Directory, *3rd ed., published by Gebbie Press, Inc., 151 West 48th Street, New York, New York. Pages, 420. Price, $19.95.*

New directory of house publications lists more than 4000 leading company and industrial publications in the U. S. and Canada including names, addresses of issuing company, editors, specific information about the publication, its circulation, and editorial content. Differs from previous similar publications in that it gives specific information not otherwise available. Directory is a 8½ by 11 in. letterpress volume, illustrated with nearly 2000 pictures, that serves as a comprehensive source of information on the huge house organ field. Material for the directory was gathered from reports of advertising agencies, public relations firms, and from more than 15,000 large and small businesses from coast to coast.

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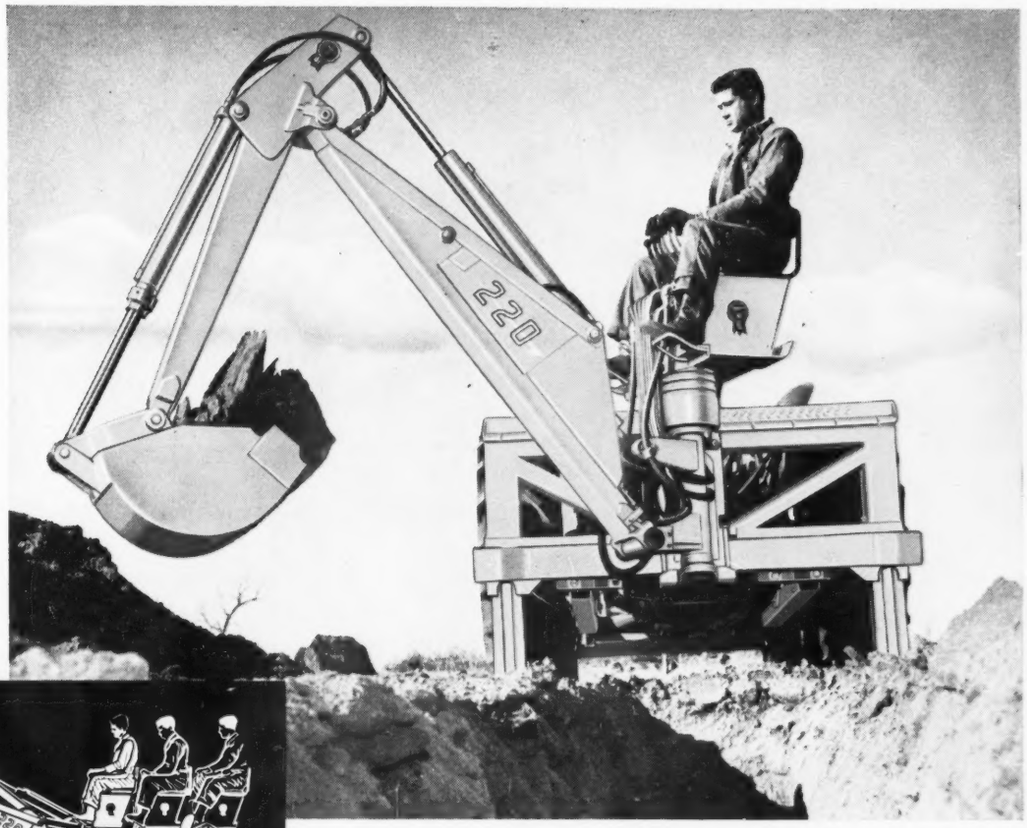

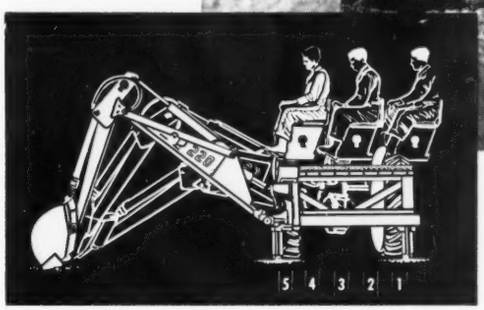

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